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DEVELOPMENT OF LANGUAGE AND VOCABULARY IN YOUNG CHILDREN

by

HAROLD M. WILLIAMS, Ph.D.
MARY L. MCFARLAND, M.A.
and
MARGUERITE F. LITTLE, M.A.

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FOREWORD

The Station has maintained a steady interest in the growth of language and vocabulary which dates from the substantial contribution made by Dr. Madorah E. Smith in 1926 followed by the careful analysis of the speech sounds of young children in 1931 (by Wellman, Case, Mengert and Bradbury).

Parts One and Two of the present monograph throw new light on the theoretical and technical questions involved in such inquiries and give the steps by which new methods of measurement have been developed.

In Part Three is presented an effective revision of the Smith vocabulary test for preschool children. Maturity of the child's vocabulary is indicated by the number of words to which he responds adequately, in a sampling drawn from Thorndike's word list. The correlation with the original, longer Smith test is .98; the reliability (correlation between Forms I and II), .96. In addition to making definite improvements in the test materials and procedures, the authors establish the fact that environmental factors are potent in determining the extent and maturity of children's vocabularies.

Part Four comprises an account of the construction and utilization of a new scale of language achievement, applicable from birth to six years.

Included in the monograph are manuals for the administration of the two scales. Photographic materials may be obtained from the Station at cost.

With so much of the groundwork carefully done, it is hoped that research workers elsewhere may assist in the widespread application of these methods. Certainly a complete report on the development of language in this age range would reveal many patterns significantly related to child behavior and adjustment.

GEORGE D. STODDARD

Office of the Director
Iowa Child Welfare Research Station
University of Iowa
March 11, 1937

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PART ONE

AN ANALYTICAL STUDY OF LANGUAGE ACHIEVEMENT IN PRESCHOOL CHILDREN

by

HAROLD M. WILLIAMS

AN ANALYTICAL STUDY OF LANGUAGE ACHIEVEMENT IN PRESCHOOL CHILDREN

The data reported in this study were collected for the purpose of making certain preliminary analyses which seemed essential for the organization of a scale of language development for preschool children. In particular there seemed to be a need for a more accurate determination of those aspects of language development showing sufficient independence to require special attention in the construction of a scale. This objective necessitated making a rather broad and inclusive analysis of the language achievement of a single group of children. The results from such an analysis are presented here.

The primary emphasis in this study is on expressive usage. This may be defined as that degree of skill which a child has acquired in the actual use of conventionalized language in communication. In this report certain problems of method, the interrelationships of various aspects of this complex ability, and the degree to which these are related to maturity and brightness are considered.

A preliminary observational analysis of language in its expressive setting suggested the following aspects as being worthy of study:

1. The ability to make the necessary speech sounds
2. Correctness in word usage
3. Development of the sentence or expression unit
4. Vocabulary

Test Techniques

The techniques which seemed capable of eliciting the points desired in the analysis were as follows: a specially designed test of the ability to produce the common speech sounds of the English language, a phonetic transcript of the children's spontaneous speech, and tests of vocabulary.

The test for speech sounds was a modification of that reported in the study of speech sounds by Wellman, Case, Mengert, and Bradbury (5). Photographic copies of pictures were used to elicit the desired words as spontaneously as possible. These were checked, when need arose, by having the child repeat the word after the examiner. Ninety-eight sounds and consonant blends were tested.

The consonant blends to be included in the test were chosen on the basis of frequency of appearance in the 2,500 most frequently used words in the Thorndike list (3), and the International Kindergarten Union (2) list of 2,500 words. The score on this test was the total number of sounds correctly given.

The phonetic transcription was made in the play and group situation, records being taken of the conversation as it occurred and was clearly heard by the observer. The necessary sampling from each child usually extended, therefore, over several days.

The sampling unit was what seems preferable to be called an expression unit rather than a sentence. This might be as brief and incomplete as a single word, or might extend over several highly connected clauses given together as a more or less integrated unit.

Units in which the child has something to express to some one else were selected for the records to be used in this study. Forty such units were sampled from each child. It is believed that this method gave a fairly representative sample of the child's expressive control over language in a type of situation where the conventional ellipsis common in replies to questions would be at a minimum.

The need for an index of correctness of word usage was emphatically brought forward in the preliminary observations. Very often, especially with younger children, a large proportion of words is seriously mutilated from the point of view of conventional speech, in a manner which cannot necessarily be referred from ordinary speech sound substitutions. The score for this unit was the number of words conventionally given per fifty running words. The total score was therefore 50. The judgment regarding correctness of usage was made as far as possible in terms of the meaning of the total expression unit.

From the many measures of expressive control possible from the phonetic transcript, the following were chosen for treatment in this report: (1) correctness and completeness of word usage, (2) mean length of the expression unit, (3) sentence completeness in terms of the subject-predicate-object relationship, and (4) complexity of organization of the unit in terms of the grammatical classification of simple, compound, and complex.

In calculating the mean number of words per unit, the practice of the International Kindergarten Union committee was favored in deciding what should be called a word. Combinations such as "I'h" were treated as one word. On the other hand, words run

together phonetically such as "willye" were not so counted. Adhering to the definition of expression unit given above, two statements given in immediate succession without pause and intimately related were treated as a single compound sentence. The score was the mean number of words per unit of expression.

In the analysis for completeness, the subject-verb-object relationship was the full requirement, conventional ellipsis like "I think I will" being scored as complete. The classifications of unintelligible, incomplete, and complete were weighted arbitrarily as 0, 1, and 2 for the total score.

In the analysis of complexity of the sentence the implied, if conventional, form was accepted. For example, "I know I'm going" would be scored as complex. In view of the many contradictory factors influencing any statistical weighting, arbitrary weights of 0, 1, 2, 3, and 4 were given to unintelligible, simple, complex, and compound-complex units for the total score.

For the measurement of vocabulary, the Van Alstyne (4) and a modification of the Smith (6) test were used. In this modification two comparable lists of forty-two words each, sampled at random from the Smith test, were given. The test was given in two ways, an A series in which pictures and materials were used in the attempt to elicit the desired word spontaneously, and a B series in which the examiner used the word and required the child to react appropriately by action or verbal response. The B examination was given at the end of the A series on only those words failed by the child on the first trial. The two lists were given on successive days. Other modifications in the test included photographic reproductions of the stimuli as vivid and detailed as possible, as well as certain changes in the presentation of the statements.[1] In both vocabulary tests the score was the total number correct.

Reliability of Techniques

The method of phonetic transcript being a relatively new technique for this purpose, a brief critique of it might be of value. In the first place, particular care should be taken to record only those units which are clearly and completely heard, the eye being used to aid the ear. Since there is undoubtedly a tendency in the transcript to conventionalize the sounds actually made by the children, the method is probably chiefly valid when it is used as a measure

1 This test is more fully described in the third study in this monograph.

of deviation from the conventional form rather than as a true analysis of the sounds as produced, and it has been so used in this study. Nevertheless, this tendency, in a trained observer, is very much less than when ordinary longhand or shorthand methods are used.

A quantitative validation of the method was made in terms of the per cent of agreement between observers trained in phonetics. Six hundred ninety-one speech sounds in a running sample were recorded with 88 per cent agreement between two such observers including both omissions and disagreements. When certain fine distinctions in reporting, such as the difference between a pure a and the diphthong aɪ, or between o and oʊ, were eliminated, this percentage rose to 95.

It was also possible to compare the record made at one hearing in the actual situation with a leisurely study of a high quality dictaphone recording made by the Betts technique (1). The objective check-up showed that the phonetic transcript may at times be noticeably in error on very long units. For this reason the age of five probably represents the upper limit of valid applicability of the method. The per cent of agreement between the phonetic transcript and the objective record for 687 speech sound units common to both was 92. Betts has shown that a large per cent of the total language at the grade school level is lost in the phonetic transcript, but this conclusion does not apply to the relatively short units recorded by the method used here. The International phonetic alphabet was used. Naturally, its successful use is conditioned by the delicacy of hearing and the training of the recorder.

The scoring of the various test items in the language units has been admittedly subjective and arbitrary at many points, but this is more or less inevitable in this type of material. The individual differences as a whole were so gross as to outweigh by a considerable margin the arbitrariness of these decisions. The per cent of agreement between two scores for various test analyses is shown in the tabulation below:

Test	Number of Items	Per Cent Agreement
Word usage	150	88
Sentence length	120	100
Sentence completeness	120	73
Sentence complexity	120	83

These language tests involved a fairly generous time allotment for each child. The vocabulary units occupied thirty minutes of individual testing time, the speech sounds unit ten. Approximately two hours per child were necessary to obtain the forty units in the phonetic transcription.

Results

The results to be reported here were obtained from a total group of seventy children distributed as follows in chronological age and mental age:

Age, Months	Children	
	Chronological Age	Mental Age
30 to 42	13	6
43 to 54	23	13
55 to 66	18	18
67 to 78	16	16
79 to 90	0	13
90 and over	0	4

All of these children were not measured on all tests. A special group of thirty-eight three- and four-year-old children completely tested on all items was therefore selected and the data on these were treated in the same way as the data on the whole group. Test reliabilities were calculated on this special group.

The reliability of the various test items was predicted from chance halves of the test. For the total number of speech sounds given correctly, the reliability was .91; for word usage it was .94. The other reliabilities were: sentence length .86, sentence completion .89, and sentence complexity .87. The reliability of the total revised Smith test predicted from both forms was .84 for this group. It is substantially higher over the whole age range to which it is applicable. The reliability of the Van Alstyne has been reported as .87 over a six months age range at the three-year level.

Though the range of effectiveness of the various test scores varied considerably in the group, there were no zero scores and few perfect scores on the tests used.

Test Intercorrelations

The most essential data for the present analysis are the intercorrelations between the variables considered. These are presented in Table 1 for two groupings: (1) all of the children available for

Table 1

Intercorrelations of Variables

Group	Number	Mental Age	Number	Speech Sounds	Number	Word Usage	Number	Length of Unit	Number	Completeness of Unit	Number	Complexity of Unit	Number	Van Alstyne Vocabulary Test	Number	Smith-Williams Vocabulary Test
Chronological Age																
Total	70	.88 ± .02	38	.31 ± .09	70	.60 ± .05	70	.68 ± .04	70	.31 ± .07	70	.56 ± .06	48	.57 ± .07	58	.62 ± .05
Restricted	38	.56 ± .08	38	.31 ± .09	38	.43 ± .09	38	.54 ± .08	38	.41 ± .09	38	.45 ± .09	38	.36 ± .09	38	.16 ± .11
Mental Age																
Total			38	.12 ± .11	70	.59 ± .05	70	.69 ± .04	70	.33 ± .07	70	.59 ± .05	48	.66 ± .05	58	.75 ± .04
Restricted			38	.12 ± .11	38	.49 ± .08	38	.78 ± .04	38	.55 ± .08	38	.59 ± .07	38	.52 ± .08	38	.47 ± .09
Speech Sounds																
Total					38	.64 ± .06	38	.60 ± .07	38	.61 ± .07	38	.62 ± .05	38	.16 ± .11	38	.01 ± .10
Restricted					38	.64 ± .06	38	.60 ± .07	38	.61 ± .07	38	.62 ± .05	38	.16 ± .11	38	.01 ± .10
Word Usage																
Total							70	.66 ± .05	70	.72 ± .04	70	.62 ± .05	48	.61 ± .06	58	.55 ± .07
Restricted							38	.62 ± .07	38	.80 ± .04	38	.57 ± .07	38	.36 ± .09	38	.27 ± .10

Lengh of Unit								
Total	70	.42 ± .07	70	.79 ± .03	48	.55 ± .07	58	.51 ± .07
Restricted	38	.65 ± .06	38	.80 ± .04	38	.56 ± .08	38	.37 ± .09
Completeness of Unit								
Total	70	.52 ± .06	48	.36 ± .08	58	.34 ± .08		
Restricted	38	.74 ± .05	38	.41 ± .09	38	.21 ± .10		
Complexity of Unit								
Total	48	.50 ± .07	58	.50 ± .07				
Restricted	38	.56 ± .08	38	.41 ± .09				
Van Alstyne Vocabulary Test								
Total	58	.67 ± .05						
Restricted	38	.59 ± .07						

a given correlation and (2) a selected group of thirty-eight three- and four-year-old children on whom a complete set of data was available. Aside from fluctuations which seem to be chance in character, the intercorrelations show the following general tendencies:

1. Consistent with expectation, there is a decrement in correlation with chronological age, but not mental age, in the selected group, due to selection in the former variable.
2. No consistent trend is shown in the correlation of the various tests with chronological age.
3. There is a tendency for the correlation with mental age to rise progressively from speech sounds and usage through unit organization to vocabulary.
4. The various aspects of organization show only moderate intercorrelations.

A further control of results was introduced through the use of the partial correlation technique. Second order partial correlations between the language items, with chronological age and mental age held constant, are given in Table 2.

In terms of this analysis, command over speech sounds and the various aspects of language organization tend to cohere fairly well but not highly, the second order partial correlations ranging from .28 to .71. Vocabulary, especially the revision of the Smith test, tends to show the greatest independence, the second order partial correlations with the other aspects of language studied tending to be below .35, with three exceptions. It would appear, then, that with the exception of vocabulary, or for special reasons, these aspects of language development may be welded into a single unit scale of language achievement.

Summary

A group of logically distinct language abilities of preschool children was studied analytically for the purpose of ascertaining the degree of independence they displayed. The ability to enunciate speech sounds was determined by a specially devised test in which the habitual pronunciation of the sounds was the measure. The accuracy and completeness of word pronunciation, the length, grammatical completeness, and grammatical complexity of the expression units of the children were scored from phonetic transcripts of their spontaneous conversation. In these transcripts, replies to questions and other conventional ellipses were not used. The method of

Table 2
Second Order Partial Intercorrelation of Tests, Chronological and Mental Age Held Constant

Group	Number	Word Usage	Number	Length of Unit	Number	Completeness of Unit	Number	Complexity of Unit	Number	Van Alstyne Vocabulary Test	Number	Smith-Williams Vocabulary Test
Speech Sounds												
Total	38	.67	38	.71	38	.66	38	.71	38	.35	38	.08
Restricted	38	.60	38	.69	38	.58	38	.60	38	.57	38	.08
Word Usage												
Total			70	.41	70	.70	70	.41	48	.43	58	.24
Restricted			38	.42	38	.66	38	.38	38	.13	38	.09
Length of Unit												
Total					70	.28	70	.66	48	.65	58	.01
Restricted					38	.41	38	.67	38	.28	38	.04
Completeness of Unit												
Total							70	.43	48	.25	58	.16
Restricted							38	.61	38	.16	38	–.02
Complexity of Unit												
Total									48	.19	58	.12
Restricted									38	.36	38	.22
Van Alstyne Vocabulary Test												
Total											58	.35
Restricted											38	.76

phonetic transcript was found to be reliable by checking with the report of another trained recorder and with a high fidelity electrical recording.

Heterogeneity in chronological age and mental age of the children was controlled by the selection of a special group of narrow chronological age and by the partial correlation technique. It was found that there was a moderate correlation between all these abilities, except vocabulary, which showed a rather high degree of independence.

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PART TWO

A QUALITATIVE ANALYSIS OF THE ERRONEOUS SPEECH SOUND SUBSTITUTIONS OF PRESCHOOL CHILDREN

by

Harold M. Williams

A QUALITATIVE ANALYSIS OF THE ERRONEOUS SPEECH SOUND SUBSTITUTIONS OF PRESCHOOL CHILDREN

The table presented in this study (Table 1) has been compiled as a tentative summary of the nature and relative frequency of the erroneous speech sound substitutions of a group of normal preschool children. The table was derived from an analysis of the original tests upon which the monograph by Wellman, Case, Mengert, and Bradbury[1] was based.

The relative frequency of correct pronunciation of 133 English speech sounds was given in this monograph. It has seemed to the present writer, however, that a knowledge of the nature of the commonest errors of children in speech sounds might also be useful from both the clinical and linguistic points of view.

The present study includes data from varying numbers of children, as tests were available, up to a maximum of 130 children. The age range was from two and one-half to six and one-half years on each sound. Only the total results are reported here as the interest was primarily in characteristic substitutions. One would expect, of course, genetic change in the substitutions, but again the emphasis here is on the relatively stable type of error. It would be very difficult to study substitutions below this age range because of the possible irrelevancies in the responses of such young children.

The results in both the previous monograph and this paper hold, of course, only within the limitations of sampling and technique from which they were derived. The sampling is restricted to children in the middle-western area of the United States, and the sound qualities from which errors are calculated are those characteristic of this region. The stimulation to which the majority of the children in the sample had been subjected, however, was that of the close approximation to standard speech for this area as found in a relatively well-established community of relatively high socio-economic status and with a very small proportion of foreign or

1 Wellman, Beth L., Case, Ida Mae, Mengert, Ida Gaarder, and Bradbury, Dorothy E.: Speech Sounds of Young Children. Univ. Iowa Stud., Stud. in Child Welfare, 1931, 5, No. 2, Pp. 82.

Table 1

Most Frequent Substitutions in 104 Speech Sounds

Sound	Number of Substitutions	Substitution*	Per Cent of Substitution	Total Per Cent of Error	Children	Sound	Number of Substitutions	Substitution*	Per Cent of Substitution	Total Per Cent of Error	Children
Consonant Elements											
p–	2	pw–	5	7	132	ð–	5	d–	18	24	125
–p	1	–(p)**	3	3	111			–θ	31		
b–	0			0	130	–ð	6	–d	6	47	118
–b	2			2	120			–f	3		
t–	0			0	128			–s	3		
–t	2			3	123			(s)–	7		
d–	1	g–	8	8	129	s–	9	θ–	6	22	126
–d	2	–(d)	5	6	126			t–	3		
k–	3	t–	6	8	132	–s	5	–θ	14	22	125
–k	2	–(k)	4	6	127			–(s)	4		
g–	1	d–	6	6	128	z–	3	s–	3	5	122
–g	2			6	130	–z	5			6	127
m–	1			1	130	ʃ–	8	s–	14	21	130
–m	2			2	131	–ʃ	4	–θ	3	8	112
n–	0			0	132	–ʒ–	7	–z–	3	12	120
–n	0			0	131			–dʒ–	3		
–ŋ	3	–n	17	22	127	tʃ–	5	ʃ–	5	15	126
		–(ŋ)	4					t–	4		
ʍ–	3	f–	6	20	127			s–	4		
w–		w–	12			–tʃ	5	–s	6	13	117
	3			4	123			–t	4		

f-	4			6	127	dʒ–	5	d–	6	15	125
-f	1			2	121			tʃ–	3		
v–	3	b–	17	20	125	–dʒ	4	–ts	5	11	42
–v	5	–b	12	18	124	l–	3	w–	8	11	130
		–(v)	3			–l	3	–w	10	13	124
–θ	10	f–	16	32	129	r–	3	w–	4	6	129
		s–	5			j–	5			8	130
		t–	3			h–	2			2	130
–θ	7	–s	19	38	129						
		–f	13								

Consonant Blends

pr–	5	p–	15	26	73	pl–	4	pr–	6	13	117
		pə–	5					pw–	6		
		pw–	4					p–	6		
br–	4	b–	20	26	113	bl–	6	b–	11	23	122
		bw–	4					bw–	5		
								br–	3		
tr–	5	tw–	9	24	115	gl–	3	g–	5	12	81
		t–	7					gw–	5		
		kr–	5								
dr–	8	dw–	7	19	102	fl–	5	f–	17	23	98
		d–	5			kl–	5	k–	12	12	95
kr–	9	kw–	10	26	110	kw–	3	k–	4	6	79
		k–	6			tw–	3	t–	6	10	77
		gw–	8					f–	3		
gr–	9	g–	6	25	72	–lz	3			3	73
		d–	3			–mz	2	–m	6	7	78
		dr–	3			–dz	5	–z	5	15	72
fr–	4	f–	17	20	84			–dθ	5		

Table 1 (Continued)

Sound	Number of Substitutions	Substitution*	Per Cent of Substitution	Total Per Cent of Error	Children	Sound	Number of Substitutions	Substitution*	Per Cent of Substitution	Total Per Cent of Error	Children
θr-	8	fr-	10	22	86	-gz	3	-gs	4	6	75
		f-	5			-nz	4			5	72
sk-	7	θk-	7	28	85	-ŋz	5	-(ŋz)	5	11	77
		k-	6					-ŋ	3		
		θm-	6			-ld	4	-d	14	17	69
sl-	10	t-	5	29	86	-lk	3	-k	23	51	39
		s-	9					-ɔk	23		
		θ-	5					-t	5		
		f-	4			-lf	3	-f	14	16	70
		θl-	3			-mp	1	-m	8	8	87
sm-	6	θm-	7	21	99	-nd	2	-n	14	15	85
		m-	6			-nt	4	-n	17	22	64
		p-	5					-m	3		
sn-	6	(sn)-	8	29	74	-ns	6	-nts	5	10	70
		θn-	7			-ps	4	-pθ	5	10	81
		n-	5			-ks	5	-s	5	16	87
		s-	4					-kθ	5		
		t-	4					-z	3		
sp-	5	p-	17	24	106	-ŋk	4	-n	4	7	85
st-	4	t-	17	26	111	-ts	6	-tθ	4	11	79
		θt-	5					-s	3		
		s-	3					-s	25		
sw-	12	f-	10	30	82	-st	4	-t	4	37	72
		θw-	4					-θt	4		
		(sw)	4					-(st)	4		

Triple Blends											
spr–	7	p–	11	29	73	skr–	13	skw–	8	39	79
		pr–	4					kr–	5		
		θpr–	4					θkr–	5		
		spw–	3					tr–	3		
		sp–	3					sk–	3		
str–	11	tr–	17	31	89	spl–	8	kw–	3		
		stw–	6					p–	10	18	83
						skw–	13	k–	7	27	94
								sk–	3		
Vowels											
a	2	a	3	5	117	ə	1				
æ	5	ɛ	7	14	123	i	3			3	125
		a	3			ɪ	6	ɛ	21	29	124
		æ	6	20	121	ɔ:	2	a	3	5	113
ɛ	7	ɛə	5			u	1				
		e	4			ʊ	2			3	116
ɛ:	4	ɛ	8	16	48	ʌ	4	ɑ	4	8	123
		ə	4			əɹ	9	ʊ	3	14	86
								ə	3		
Diphthongs											
ɪ	5	ɑ	6	10	124	ju	5	u	3	8	97
aʊ	8	ɑ	10	19	126						

* Substitutions with frequencies of 2 per cent or less are omitted.
** Parentheses about a sound indicate imperfect approximation.

other variants. The definition of the sound qualities from which these children deviate could, therefore, be rather precisely drawn.

The original records give, as a whole, the child's spontaneous use of the sounds as he spoke them in the naming of objects in pictures. Thus the sounds were elicited in a highly constant, but specific phonetic setting.

Analysis of Middle-Western Speech

The principal consonantal variations are ɹ, əɹ, and ɬ. The sound ɬ is quite definitely palatalized, giving a darker color than the European l. In ɹ, and əɹ the tongue is quite retracted, the tip being turned progressively upward and backward as the sound is produced. The variants in usage most frequently heard by these children are summarized in the following tabulation:

Variants	
Sound	Description
ɬ	palatalized
ɹ	tongue retracted, tip curled
ɛɹ	less progressive curling
ʍ	strongly aspirated
h	clearly aspirated
w	not strongly rounded
a	back, rather gutteral
æ	strongly frontal
ɛ:	always diphthongized to ɛə
ɪ	always short
u:	not highly rounded, usually uə
ʊ	short
eɪ	fairly close

From the total list of the 133 sounds studied by Wellman, Mengert, Case, and Bradbury, 104 were selected for this study. The primary basis of selection was the elimination of the so-called "medial" position of the consonant sounds. The position assumed in this study is that, according to the laws of English syllabification, consonants necessarily stand at the beginning or end of a syllable. Vowels, naturally, may occupy any position.

Variation in Errors

A frequency distribution of the number of substitutions for the various sounds is given in the following tabulations:

Substitutions	Sounds	Total Substitutions
0	5	0
1	9	9
2	13	26
3	17	51
4	14	56
5	19	95
6	7	42
7	5	35
8	5	40
9	4	36
10	2	20
11	0	0
12	2	24
13	2	26
Sounds	104	460
Mean per sound		4.6

The most striking result of this analysis is the great variability of the errors on certain sounds, particularly the more complex ones. Simple norms of error seem, therefore, to be of little value. A conception of type involving patterns of behavior in individual cases, such as the lisp in series of combinations involving *s*, appears to be the more significant procedure.

This finding lends evidence contrary to those theories of phonetic change which appeal to children's errors as one source of change. Any cultural group would be rather in a dilemma to choose a particular form from as varied a list as this.

Nature of the Substitutions in Consonant Elements

Perhaps the most interesting analysis possible from these data is the search for laws of substitution in a genetic setting such as this.

In the case of consonant blends, it is possible for the child to break the complex task down in various ways into simple forms. This is not possible in the consonant elements, so that the search must be made in terms of simplification or such bases as place of phonation, acoustic similarity, and the like.

It was demonstrated in the monograph by Wellman, Case, Mengert, and Bradbury that the range of difficulty of consonant elements is substantial, varying with this group from 40.3 to 98.5 per cent correctly given. This monograph also draws the following

conclusions relevant to the present inquiry: (1) The difficulty of the consonant element varies with respect to its position in the word, the final position being significantly more difficult than either initial or medial. (2) Nasals seem to be slightly less difficult than stops, fricatives being decidedly more difficult than either. This conclusion holds for all positions. (3) It was pointed out finally that no difference in difficulty existed for pairs of sounds voiced and unvoiced, including the voiced b, d, g, v, ð, and z and their voiceless counterparts.

The influence of position in phonation can also be calculated from their data. The percentages of children completely tested on representative sounds for the various positions are given in the following tabulation:

		Labial			Alveolar			Linguo-velar	
		Initial	Final		Initial	Final		Initial	Final
Stop	p	98.0	79.7	t	89.0	64.9	k	86.3	92.1
Voiced	b	94.0	70.1	d	96.7	76.2	g	84.0	77.3
Nasal	m	98.6	93.4	n	98.6	84.0			73.8
Fricative	f	88.0	77.4	s	59.1	60.4			
Voiced fricative	v	52.8	64.1	z	63.1	71.8			

The data for all comparisons yield thoroughly contradictory results as far as place of phonation is concerned. It would appear that the great variations in difficulty among the consonant elements cannot be accounted for on the basis of position in phonation.

There remains to be considered, however, evidence from the nature of the substitutions made by the children. Following the same organization in analysis, we may consider first substitutions according to position in the word. On the elements, p, b, t, d, k, g, m, n, f, v, θ, ð, s, z, ʃ, tʃ, dʒ, and l, permitting such comparison, we find sixty-three substitutions on the initial and fifty-seven on the final position, indicating no difference in the number of substitutions, although the per cent of error is higher in the final position as shown by the previous monograph. Of the sixty-three substitutions in the initial position twenty-nine or 46 per cent are found in the final position also. This would indicate some tendency for communality in the type of substitution in any position, but by no means perfect consistency.

The nature of the substitutions according to the classification stop, nasal, and fricative, in both initial and final position, is shown in the following tabulation:

Sounds	Per Cent Substitutions Stop	Nasal	Fricative	Other	Number
Stop (6 sounds)	94.4	0.0	5.6	0.0	18
Fricative (9 sounds)	25.5	3.3	53.4	17.8	90

There were not enough errors in the nasal group to warrant analysis. There is, however, in the other two categories a strong tendency for the sound substituted to belong in the same category as the one substituted for. The chief exception here is in the substitution of the easier stop for the fricative.

On the voiced and unvoiced comparison the following percentages occur:

Sound	Per Cent Substitution Voiced	Unvoiced	Number
Voiced (6 sounds)	70.0	30.0	40
Unvoiced (6 sounds)	29.9	70.1	47

There is, therefore, a strong but not universal tendency to substitute the appropriate (voiced or unvoiced) category.

The consistency with which place of phonation is kept constant in the substitutions is shown in the following tabulation.

	Total	Same		Different						Sounds
				Forward		Back		Total		
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	
Substitutions	142	66	46.5	41	28.9	35	24.6	76	53.5	24

In this analysis, the categories used were velar, alveolar, labiodental, and labial. The place of phonation is therefore as frequently changed in these substitutions as it is retained. Neither is there any consistent tendency in the direction of change of place.

The final analysis of consonant elements considered here is the tendency toward the substitution of easier sounds for those more difficult. Thirty-one consonant elements in initial and final position were compared with the ninety-nine sounds substituted for them, for which difficulty ratings were available. The criterion of difficulty was the per cent of children completely tested on a sound group as given by Wellman, Case, Mengert, and Bradbury. The mean difficulty of the required sounds was 70.0 per cent success. The mean difficulty of all the sounds substituted for these was 75.1 per cent. There is a tendency, therefore, toward the substitution of easier sounds, but the difference in difficulty between the groups is surprisingly small.

The data regarding consonant elements may be summarized thus. There is a wide range in difficulty in the consonant elements in which only position in the word and the classification of stop, nasal, and fricative show consistent results. There is no consistent difference in difficulty between voiced sounds and their voiceless equivalents or between three positions of phonation. Children otherwise show a slight tendency to substitute empirically easier sounds for the more difficult.

One general interpretation which can be put on these findings is that children tend to depend principally on hearing in their approximation of speech sounds, attempting to produce something which sounds like the standard, though regressing at times toward easier sounds. This conclusion is supported by the following facts: (1) identity in place of phonation plays practically no part in the type of substitution employed, (2) the equally difficult voiced and voiceless sounds are characteristically not confused in substitution, and (3) stops and fricatives are seldom confused in substitution except for the tendency to replace the more difficult fricative by the easier stop.

One educational implication of this finding is that it might be advisable to emphasize more frequently with young children the demonstration of oral position in sound formation, a method which has proved very successful in teaching foreign languages to adults. It also re-emphasizes the importance of intact hearing in language learning.

Nature of the Substitutions in Consonant Blends

A new possibility appears in the analysis of consonant blends, namely, the tendency toward simplification through the use of only one of the sounds blended. The results for all the double blends are summarized in the following tabulation:

Substitutions	Number*	Per Cent
First element of blend	32	16.8
Second element of blend	17	8.9
First element plus substitute	42	22.1
Second element plus substitute	31	16.3
Insertion or addition	8	4.2
Other sounds	60	31.6

*Number of blends studied = 40; total number of errors = 191

The substitutions distribute over the six possible categories, the

largest proportion coming from the substitution of completely different sounds. Substitution may involve either member of the blend alone, or either combined with another substituted sound. A slight tendency for the second element of the blend to suffer at the expense of the first is evidenced.

The mean difficulty of the double blends was studied on the same basis as the consonant elements. The mean percentage of success for thirty-eight blends was 58.6. The mean percentage for the 127 substitutions for which there were difficulty ratings was 76.6. The regression toward the easier sounds was substantial, therefore, for the blends. The fact that the mean difficulty of the sounds substituted was practically identical for both consonant elements and blends is interpreted as an indication of the genuineness of difficulty as a basis for the regression.

For the triple blends, the results shown in the tabulation below were found. Thirteen of the fourteen combinations possible in this situation were used by the children, although only five blends and a total of forty-nine errors were involved.

Substitution	Number
First element	2
Second element	4
Third element	0
First and second element	5
First and third element	2
Second and third element	5
First element and substitute	4
Second element and substitute	4
Third element and substitute	5
First and second element and substitute	6
First and third element and substitute	3
Second and third element and substitute	4
Addition	1
Other sound	4

Law breaks down into almost complete individual idiosyncracy in a case of this kind.

Nature of Vowel Substitutions

It is generally admitted that precise work, both in the original recording and later analysis, is most difficult in vowel qualities.

The validity of any discussion based on simple observation of these changes is, therefore, doubtful. The following conclusions are tentatively drawn from this sampling of data: (1) the short (close) vowel qualities ɪ, ɛ, and æ tend to be relatively frequently confused; (2) ɔɪ seems to be fairly difficult as measured by the large variety of pure vowels and diphthongs substituted for it; (3) there is a definite tendency for pure vowels to be substituted for diphthongs, a result which is quite the opposite of the general tendency in English.

Summary

The following general conclusions are drawn from this study of the normal speech sound substitutions of preschool children in American middle-western English.

1. The variability of substitutions is so great that the application of the normative conception seems to be of little value.
2. The only consistent bases for variation in difficulty seemed to be the position in the word and the classification stop, nasal, fricative.
3. Within the limitation imposed by the tendency to substitute easier sounds for those more difficult, children tend to substitute sound having acoustic similarity to the standard.
4. There is a slight tendency to substitute the pure vowel for the diphthong.

PART THREE

A REVISION OF THE SMITH VOCABULARY TEST FOR PRESCHOOL CHILDREN

by

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A REVISION OF THE SMITH VOCABULARY TEST FOR PRESCHOOL CHILDREN

The present study is a report of the results on a revision of the Smith vocabulary test (2). While certain changes aiming principally at economy in administration have been made in the test, most of its basic features have been retained. It seems desirable, however, to review briefly some of these features.

The Problem of Vocabulary Measurement

Careful consideration of some of the intricacies involved is essential to any attempt at measurement of vocabulary today. At least three fundamental issues present themselves: (1) a decision regarding the choice of the particular vocabulary ability to be measured, (2) methods of measurement, and (3) in any brief test situation, problems of sampling.

That the term vocabulary itself covers many different types of achievement has become generally accepted. Among the distinctions which have been made are: (1) oral, reading, and written vocabulary, (2) recognition and recall, (3) "meaning," i.e. a psychological as opposed to "formal" or dictionary analysis of elements, and (4) use versus verbal definition. Williams (4) has proposed a distinction between extent (number of different symbols) and power or depth (explicitness and richness of meaning).

It is obvious, then, at the start that the student of vocabulary must choose some particular aspect of this complex achievement for measurement. Work with young children is necessarily confined principally to the oral vocabulary, and this feature of the Smith test has been retained in the revision.

Vocabulary Area Measured in Present Test

With respect to the type of ability measured, the test described here also follows closely the point of view implied in Smith's (2) test. Some amplification of this conception seems desirable. Her sampling of words was drawn from the Thorndike (3) 10,000 word list. This is an adult reading list. It is strongly modified by the inclusion under their primary forms of derivatives following certain standard patterns. It is essentially, in the opinion of the

writers, a "minimum essentials" list of basic concept symbols in rather formal adult intercommunication.

It may deviate, therefore, rather strongly from comparable lists based on child intercommunication. This suggests that the type of achievement measured in terms of this list is what might be called vocabulary maturity, the degree to which the child has achieved command over these fundamental concept symbols. By the choice of this list one probably introduces a large error in the estimation of total extent, because of its method of treating derivative forms, the omission from the list in general of colligations, and its basis of frequency of adult use. Both the Smith test and the present revision are primarily, therefore, more relative than absolute measures of total extent. For these reasons, Smith's predictions regarding total extent have been dropped.

The distinction between recognition and recall does not seem to be a particularly fundamental one. It achieves its greatest significance under the time limitations of the test situation where there may be a momentary lapse of recall. The concept of recognition is particularly unclear, since it may involve nothing more than an acknowledgment on the part of the subject that he has heard or seen the word.

Smith met the problem of recognition versus recall by what amounted to the inclusion of both. In her A questions she attempted to elicit recall of the word by an appropriate stimulus. In her B questions she used the desired word and attempted to evoke evidence of knowledge of its meaning from the child. This plan has been retained with certain modifications in procedure which will be discussed under the topic of methods of measurement. This makes the test objective the attempt to evoke knowledge of a word beyond immediate recall.

When total extent of vocabulary is the objective, the "meaning" vocabulary should receive careful consideration. The problem is most obvious in cases where a single formal word has a number of standard semantic variations. Furthermore, colligations, colloquialisms, and nonstandardized usages as well as infantilisms further complicate the situation. In addition to the sources of error already mentioned by her, therefore, these factors undoubtedly disturb seriously the estimate of total extent in Smith's procedure.

Method of Measurement

Meaning appears as a problem in method in relation to the nature

or level of response or the depth of meaning demanded of the child. Two levels of definition are recognized in the Binet test, for example, definition in terms of use and a more formal verbalized level. There may be, moreover, a still lower level, namely, appropriate use. When a child reacts to a command or uses object names consistently, he is certainly showing some comprehension of the word, even though he still might not be able to react to it on any higher verbal level. An intensive study of this "power" characteristic of vocabulary would be tedious and difficult to measure in a rapid test, even though basic research on meaning levels might reveal significant stages in maturity. The policy of accepting as satisfactory one conventional meaning for a word was adopted, with full knowledge of the further restriction on the estimate of total extent this would entail.

This factor of the form of reaction most practicable or most desirable to demand is, however, in the opinion of the writers by no means entirely a matter of arbitrary decision. The experimental possibilities in the form of presentation vary greatly. For example, objects that can be pictured may be reacted to simply by naming. To picture "pride" or "nevertheless," however, is not so easy. Again, the setting in which different words are appropriately used has an inherently great range in complexity. Contrast, for example, the verbs "jump" and "integrate." The soundest solution to this dilemma would seem to be to adopt frankly the principle of presenting the word in some appropriate or normal setting. When attempting to elicit spontaneous use of a word, it would seem to be desirable to attempt both to reduce extraneous difficulties to a minimum and to make the setting demand the desired word as exactly as possible. A good instance of extraneous difficulty in some tests has been the use of almost unrecognizable line drawings. When, on the other hand, the purpose is to elicit evidence of familiarity with a word given, accessory cues should be avoided. The Smith procedure may be criticized for the fact that in some of her questions half the word is pronounced by the experimenter. Also the separation in time of her two forms of question might have helped avoid accessory cues.

The maintenance of the child's interest in a test which will involve necessarily much that is abstract and verbal must also be considered in test construction. Pictures and responses involving other than verbal behavior are at least two methods of increasing

interest, even though they interfere with the precision of definition of the type of vocabulary measured.

Sampling

As soon as one gives up the hope of diary tabulation of a child's vocabulary, a task which becomes increasingly impracticable as his age advances, problems of sampling appear. Some of these problems have been discussed indirectly here and by Williams (4) elsewhere. In Smith's method of sampling it is possible to make the selected list quite representative of the list from which it was drawn and subject, therefore, only to the limitations inherent in the list itself.

The principal exception to this lies in Smith's method of eliminating words from the basic sample which the children of the age group being studied are practically certain not to know. She made this elimination on the basis of most of the children's vocabulary lists then available. This has been further checked by the writers against the International Kindergarten Union list (1) of 2,500 children's words and found to be valid, none of the words omitted by Smith being in this list. The extent of the sampling necessary may be inferred from the reliability of alternate forms of the test.

Further extension of the test upward in difficulty can be made simply by the inclusion of more of the words rejected by Smith from her basic sample. Our present data indicate that the test is adequate for a mental age of approximately seven years.

The extension of the lower limit of the test, which is now approximately three years of mental age, presents other difficulties. This was tried by the writers by enlarging the basic sampling of 2,000 words, in the hopes of finding a longer list of very familiar words which could be used with younger children. It was found, however, that the difficulty lay in the inability of the immature child to grasp the conditions of the test, rather than in his lack of some knowledge of the words. This method was therefore abandoned.

Summary

In summary, then, the present test purports to measure vocabulary maturity in the child as revealed through the number of words to which he responds adequately in a representative sample of the Thorndike 10,000 word list. The test is more a measure of breadth than depth or precision, one acceptable response to a word receiving

full credit. It is not contended that an accurate prediction of total vocabulary may be made from the test, although a fairly accurate prediction to the total number of the Thorndike list is probable. The test belongs, therefore, more in the relative than in the absolute category. The response required includes both recognition and recall types of behavior. It varies from simple naming to more complex types of verbal response, partly because of the variations inherent in the normal use of the words themselves, partly because of the necessity of maintaining interest. Within these limitations it purports to be a rapid and practical measure of vocabulary efficiency.

Changes from the Smith test include:

1. A shortening of the original list to eighty-four words, divided into two equivalent forms
2. Systematic adoption of the A and B principle, particular care being given to the avoidance of accessory cues in the B form and to the separation of the two in time. This was done by covering the A questions on all words first, after which the B questions are asked on all words failed.
3. Reduction of all picture materials to standard reproducible photographic form

The test is now presented on two sets of cards. On the face of each card is a picture. On the back of the preceding card is the A question for that picture and any subsequent A questions for which there are no pictures. As the picture is presented to the child, the tester may read the question from the back of the other card. The B questions are listed on cards at the end of the set. An individual score sheet is provided for each form.[1]

Results

Reliability

That the shorter sample measures vocabulary in practically the same way as the long Smith test is shown by a product-moment correlation of .98 ± .004 between score on the words occurring in the revised list and total score on the Smith test for forty children four years, four months to six years, six months in age who were tested by Smith.

The reliability of the present test was determined by Form I and Form II. This correlation was .96 ± .003 for 359 Iowa City cases

1 This test is available in preliminary form from the Iowa Child Welfare Research Station, Iowa City, Iowa. The cost will include the necessary typing, mimeographing, and photographic reproduction.

between two and six years. When the Spearman-Brown prophecy formula is applied, the reliability of the whole test is found to be .99. The probable error of measurement is .79 test words. (One hundred seventeen retests of Iowa City children were included in the above computations so that the figures are probably to some extent spuriously high.)

Equivalence of Forms

The per cent of 278 children twenty-seven to seventy-four months of age knowing each test word has been computed and a rearrangement of the words made to render the two forms more nearly equal in difficulty. The following tabulation shows the words of the test as they are now arranged.

Form I			Form II		
Word Number	Word	Per Cent	Word Number	Word	Per Cent
1	pocket	99.3	2	button	99.6
3	dish	98.2	4	window	98.9
5	take	97.8	6	corn	96.4
7	glove	95.3	8	mine	95.3
9	point	93.5	10	dry	95.3
11	splash	92.4	12	blue	93.5
13	stir	91.7	14	gun	91.0
15	love	91.0	16	gas	90.3
17	strawberry	89.9	18	too	88.1
19	mud	89.5	20	kettle	88.1
21	lion	88.5	22	closet	87.1
23	fish	86.3	24	soldier	86.3
25	watermelon	83.1	26	edge	84.5
27	flash	80.2	28	those	80.6
29	cane	77.7	30	chilly	76.6
31	ditch	75.2	32	jerk	75.2
33	Saturday	68.3	34	race	72.3
35	ocean	66.2	36	freight	67.9
37	easily	65.1	38	thin	63.7
39	spade	64.0	40	sailor	60.8
41	delivery	57.9	42	camera	59.7
43	fountain	57.5	44	west	57.2
45	cheek	57.2	46	howl	56.1
47	king	53.6	48	necklace	54.6
49	rot	52.1	50	twin	53.6
51	kangaroo	47.1	52	pave	48.5
53	week	45.6	54	postal	37.4
55	shingle	33.8	56	pebble	33.1
57	velvet	30.9	58	colt	31.6
59	price	30.6	60	guard	30.9
61	prison	27.7	62	brownie	27.3

63	rumple	25.5	64	orchard	21.8
65	shabby	14.7	66	ornament	15.1
67	scum	14.3	68	moisture	12.6
69	cider	12.6	70	stylish	11.9
71	pulse	9.3	72	mice	8.6
73	bargain	8.2	74	flesh	7.2
75	tortoise	6.5	76	skull	6.5
77	cog	3.2	78	pillar	2.5
79	arbor	1.0	80	herd	2.5
81	wampum	.8	82	hawthorne	1.8
83	defeat	.7	84	execute	0.0

The equivalence of Form I and Form II according to the new arrangement is shown graphically in Figure 1.

Group Results

The children to whom the revised Smith test has been given represent a wide divergence of socio-economic status, one group including almost exclusively children of superior status and above average mentality, the other children of low socio-economic status and below average intelligence.

The first group consists of 242 children twenty-seven to seventy-four months of age attending the preschool laboratories of the Iowa Child Welfare Research Station. These children had a mean IQ of 124, with a standard deviation of 3.29. They were rather evenly divided as to sex, 120 girls and 122 boys.

The second group includes sixty-four orphanage children twenty-eight to seventy-three months of age with a mean IQ of 84 (standard deviation, 17). There were twenty-eight girls and thirty-six boys.

The following tabulation shows vocabulary scores for the Iowa City group by six month chronological age intervals.

Chronological Age			Mean	Mean
Years	Months	Number	IQ	Score*
2	6	22	123	16.73
3	0	21	122	26.19
3	6	28	131	37.53
4	0	47	127	43.83
4	6	33	126	46.09
5	0	34	119	51.21
5	6	38	119	59.11
6	0	19	124	62.73

* Mean number of test words known

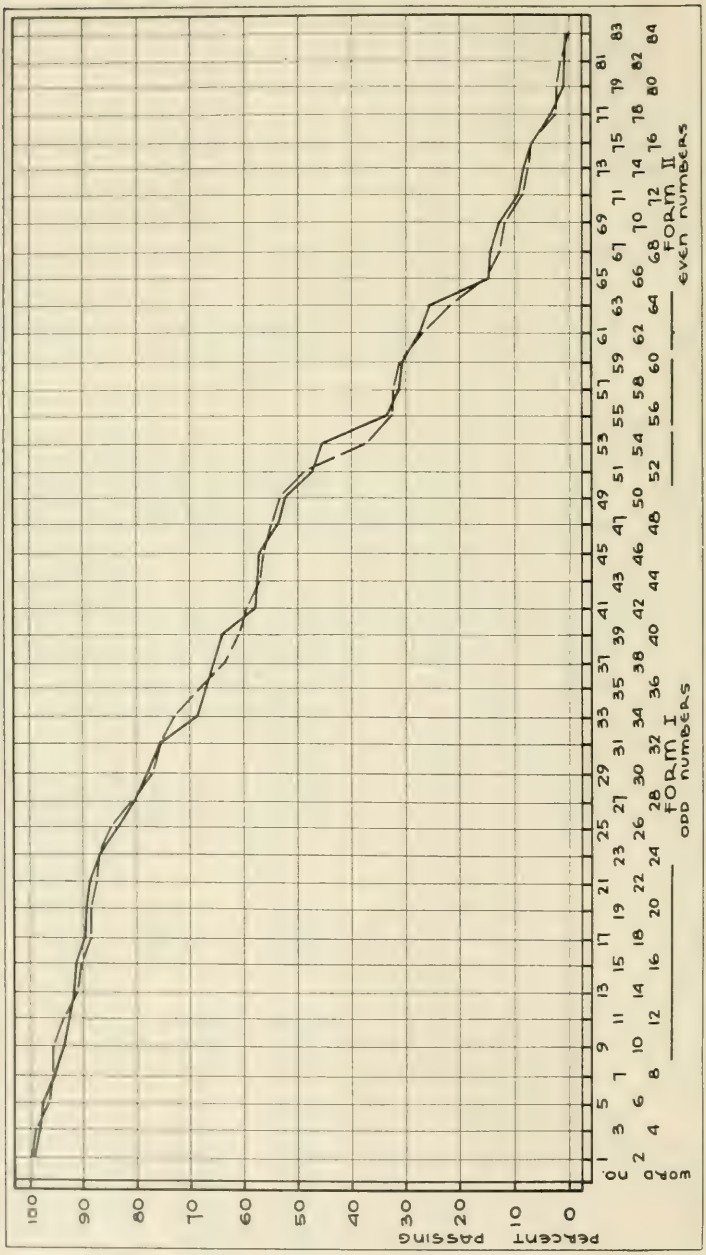

Figure 1. Equivalence of Forms I and II According to the New Arrangement of the Words

The vocabulary scores for this group when classification is made on the basis of mental age are given below:

Mental Age				Mean Number of Test
Years	Months	Number	Mean IQ	Words Known
3	0	13	113	19.92
3	6	12	120	23.75
4	0	18	116	32.93
4	6	26	119	38.81
5	0	31	123	43.61
5	6	28	125	48.93
6	0	25	127	51.80
6	6	30	126	57.07

The tabulations below, and p. 44 represent the same data for the orphanage children.

These results have normative value only in the sense that they are probably fairly representative of the particular group tested. It is doubtful, indeed, in the light of recent research, whether norms, unless constructed on an extraordinarily large scale, ever mean much more than this. An analysis of the relative achievement of the orphanage and preschool children at comparable chronological age, mental age, and IQ levels reveals the differences which may occur under varying environmental conditions.

In order to show the relative vocabulary achievement of the orphanage children, a vocabulary ratio (VR) was calculated for each chronological and mental age group. This ratio was:

$$\frac{\text{Vocabulary for orphanage children of given CA or MA}}{\text{Vocabulary for Iowa City children of given CA or MA}}$$

The following tabulation indicates the extreme vocabulary retardation of the orphanage children when classification is made on the basis of chronological age.

Chronological Age					
Years	Months	Number	Mean IQ	Mean Score	Vocabulary Ratio
2	6	11	78	2.3	.14
3	0	10	80	5.0	.19
3	6	10	89	10.3	.27
4	0	7	84	13.4	.31
4	6	8	83	17.1	.37
5	0	7	96	30.0	.59
5	6	6	85	24.5	.41
6	0	5	79	25.0	.40

The tabulation below shows that retardation is also present, although to a less marked degree, when mental age is used for the classification.

Mental Age			Mean	Mean	Vocabulary
Years	Months	Number	IQ	Score	Ratio
2	0	13	76	3.0	
2	6	15	77	4.9	
3	0	2			
3	6	11	89	11.5	.49
4	0	5	86	22.0	.67
4	6	5	85	27.2	.70
5	0	10	90	29.9	.69

Since these comparisons do not eliminate the factor of a rather wide IQ discrepancy between the Iowa City and orphanage groups, a comparison which has reduced differences in intelligence to a minimum has been provided by matching thirty-one orphanage children on the basis of mental age and IQ with thirty-one children in the Smith (2) investigation whose mental ages, intelligence quotients, and vocabularies are listed in the Appendix of that study. A vocabulary ratio to the base of the present Iowa City results was obtained for each mental age group and ratios for orphanage and Smith children compared. From the following tabulation it may be seen that while the Smith children fall slightly below present Iowa City standards, their ratios ranging from .85 to 1.00, the orphanage children of equal mental age and IQ show a very decided vocabulary inferiority with ratios of .48 to .68.

Mental Age		Investi-		Mean Mental Age,	Mean	Mean Vocabulary
Years	Months	gation	Number	Months	IQ	Ratio
3	6	Orphanage	11	42	91	.48
		Smith	11	42	91	1.00
4	0	Orphanage	9	48	88	.68
		Smith	9	48	88	.87
4	6	Orphanage	4	54	81	.62
		Smith	4	55	80	.93
5	0	Smith	7	60	93	.85
		Orphanage	7	60	92	.67

Thus the orphanage children have vocabularies which are inferior not only to those of children of the same chronological or mental age but higher IQ, but also to those of children matched

for IQ level as well. This difference is interpreted chiefly as one of environmental background. Necessarily the institution draws its population from the low socio-economic group. Under the institutional system the number of children in a cottage is large and the proportion of adults small. Language stimulation is consequently at a minimum since the adults cannot possibly give each child as much individual attention as is the case for children living in their own homes. Contacts in the orphanage are chiefly with children of similar age and similar retardation in language. There is relatively little opportunity for contacts with a rich everyday environment.

Additional evidence in support of an environmental influence upon vocabulary is drawn from the differing partial correlations between chronological age and mental age with vocabulary in the orphanage and Iowa City groups. The raw intercorrelations between mental age and vocabulary, chronological age, and mental age are given below.

Group	Number	Chronological Age	Mental Age
		Vocabulary	
Iowa City	221	.85 ± .03	.83 ± .01
Orphanage	55	.84 ± .01	.90 ± .02
		Chronological Age	
Iowa City	221		.83 ± .01
Orphanage	55		.90 ± .02

The partial correlations follow:

Correlation	Iowa City (N = 221)	Orphanage (N = 55)
Chronological Age and Vocabulary (Mental Age Constant)	.49	.13
Mental Age and Vocabulary (Chronological Age Constant)	.43	.65
Mental Age and Chronological Age (Vocabulary Constant)	.45	.60

While for the orphanage group the correlation between chronological age and vocabulary with mental age constant is practically negligible (.13) and that between mental age and vocabulary with chronological age constant is high (.65), there is little difference between these two partial correlations for the Iowa City group since it is .49 in the case of the former and .43 in the case of the latter. It would seem that mere chronological maturity has little

effect on vocabulary where environmental conditions are not favorable, but that it operates about equally with mental maturity where environmental conditions are favorable. Norms are likely to be of little value, then, where such factors are not considered.

Summary

A revised form of the Smith vocabulary test is described. The test is defined as a measure of vocabulary maturity, based on both verbal recognition and recall responses by the child to a representative sample from an adult list of "basic verbal symbols." Various sources of error in the original list and in the method of measurement have made it imperative that the test be classified as a relative rather than an absolute measure of total vocabulary extent.

The test has been shortened without loss of reliability to two equivalent forms requiring a reasonably brief testing time. Test materials have been reduced to standard reproducible form. The procedure, while basically the same as Smith's, has been modified to include more rigorous control on the recall method and a separation in time of the recall and verbal recognition responses. The present form of the scale, together with directions for use, is given in Appendix A.

Scores were obtained for two groups of children, preschool children living in homes of superior socio-economic status, and orphanage children. Differences in these two groups point to the need for exact definition of environmental stimulation in normative materials.

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PART FOUR

AN ANALYTICAL SCALE OF LANGUAGE ACHIEVEMENT

by

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AN ANALYTICAL SCALE OF LANGUAGE ACHIEVEMENT

Statement of Problem

This study is a preliminary attempt to analyze and scale the language achievement of children from birth to six years of age. In so far as language is the vehicle for communication between individuals, there must be conformance to standard conventions. This makes it possible to set up an external criterion of usage to be achieved consisting of accepted forms as found in the dictionary and in grammar textbooks. From this point of view it is obvious that the infant starts with nothing. Studies indicate that by the age of six he has acquired most of the adult language patterns.

The concept of language achievement used in this study involves the assembling of an analytical inventory of language patterns which the child must learn. Such an inventory, because of the inseparability of grammatical form and psychological function, must, at least in the present state of knowledge, involve both. However, emphasis as much as possible has been placed on grammatical analysis where this has not opposed psychological conceptions of achievement.

The primary interest, then, has been on the construction of a scale of language achievement. It is inevitable in such a construction that other aspects of a more general nature would present themselves, such as sequence of items, relative difficulty of items, sex differences, chronological age and mental age differences, average or normative attainment of linguistic growth, and environmental differences as shown in the results obtained on an orphanage group.

Scales of Language Development

Aside from Gesell's (8) indicative scale for the development of children's language from one to thirty months, no attempt has been made to scale language achievement except by Descoudres (4), who made her scale for the measurement of the linguistic development of French children.

Descoudres' (4) scale was standardized on children of from two to seven years of age among those of the wealthy and common

classes in France. Several parts were included in the test: a series of questions designed to determine the understood vocabulary; a language test for phonetics; some immediate memory tests, such as repeating numbers and syllables; mediate tests, as naming the days of the week, months of the year, songs, and poetry; a spoken language examination consisting of some vocabulary questions, such as words known in a given list of twenty-five words, picture descriptions, and enumeration; knowledge tests consisting of questions about the child, his age, friends, and knowledge of colors; and some questions in which judgment played a part. These constituted the complete test, the child's score as determined by this scale being his linguistic age. The size of the vocabulary at different ages was determined. It was found that the proportion of verbs increased with age and that the greatest vocabulary gain occurred between the second and third years.

Steps in the approximate normative development of language by infants from birth to thirty months were clinically scaled by Gesell (8). He includes what he has found to be the stages in speech progression, but states that the scale can be used only by those with a large amount of clinical familiarity with infants. It might be well to mention steps such as were found by Gesell (8), as they were somewhat suggestive in determining part of the items used here. These are some of the items included in his schedule: one month: gives definite heed to sound; two months: attends to speaking voice, vocalizes several different sounds; three months: exhibits vocal expression of pleasure; four months: laughs aloud, responds vocally when socially stimulated, vocalizes in self-imitated play; five months: gives vocal expression of eagerness and displays displeasure; seven months: vocalizes satisfaction of attaining an object; eight months: vocal expression to recognition, vocalizes in an interjectional manner; nine months: says da-da or equivalent, listens with selective interest to familiar words; ten months: incipient or rudimentary imitation of sounds, makes conditioned adjustment to certain words; twelve months: vocabulary of two "words"; fifteen months: uses four words and an expressive jargon; eighteen months: says five or more words, uses jargon conversationally; twenty-one months: joins two words, repeats things said; twenty-four months: uses words in combination.

In speaking of the development of language in infants, Lukens (9) writing in 1895 classifies his discussion under the following

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heads: reflex and automatic sounds; early babble; imitative babble; understands, but does not speak; inventive words; and originals based on analogies. These are suggestive of developmental progression.

Shirley (14) recorded the language development of the babies she studied over a period of two years. She lists the progression she found thus: 6 days—vocal grunt; 8 weeks—single syllable; 13 weeks—two syllables; 25 weeks—talks to person; 32 weeks—singing tones; 37 weeks—expressive sounds; 35 weeks—single consonants; 60 weeks—first word; 99 weeks—first pronoun; 101 weeks—first phrase; 101 weeks—first sentence.

Gesell's (8) scale comes closest to fulfilling the need for a scale of language development, but it has several limitations. In the first place it requires that one using his scale have "a large amount of clinical familiarity with infants of every age"; it is limited to the period of growth below thirty months; judgment is based on only one or two criteria and therefore is not sufficiently inclusive. Gesell furthermore did not intend his scale for use for determining a language age as intelligence tests are used for obtaining a mental age.

A scale for obtaining linguistic age should have several features. It should adequately cover language in its several aspects; it should cover an adequate age range; it should be easily and quickly administered and should not require extensive training for the tester; its measures should be as nearly objective as possible.

In forming the present scale dependence was placed on previous studies in the literature for the tentative ranking of items, on grammatical tests for the invention of skills, or on dictionaries for certain technical classifications.

Studies of Items in Organization of Sentence

Several studies have contributed other data for the analysis of sentence organization.

Dewey (5), in her study of the language used by two children eighteen and nineteen months of age, points out that one should note carefully the original sense to the child of the words. Nouns may be used by the child as verbs. Nice (12) has taken this aspect into consideration when speaking of the stage of one-word sentences through which children appear to pass. These words or symbols are often accompanied by gestures to indicate action or an object.

In the classification of words in the vocabulary of a child from

eleven months to five years, Boyd (1) included at seventeen months nouns, verbs, pronouns, adjectives, and adverbs in his classification of parts of speech. At two years he added interjections, conjunctions, and prepositions. Where in the seventeen months vocabulary only one pronoun appeared, eighteen appeared at two years. As would be expected, there was an increase in the number of words appearing in each part of speech as the child's age increased throughout the period of recording, the most notable increase occurring between the second and third years.

It is noteworthy that the percentages of the different parts of speech appearing at the third and fourth year levels increased very slightly according to Boyd's findings; that is, as new words were added to the vocabulary they were those of differing parts of speech, and no part of speech was given preference. This is, of course, dependent on the existing words in each of the parts of speech. After the establishment in a few cases, then, of the use of these parts of speech, growth would appear to be mostly a case of increase in vocabulary, which increase can be best measured by vocabulary tests.

In this volume a study by Williams (p. 1-16) shows vocabulary to have only slight correlation with oral mechanics and sentence structure, making it necessary to treat these aspects separately. As quite adequate vocabulary tests have been devised, it has not been deemed necessary to include vocabulary as an essential part of this study, even though it can well be included in any complete analysis of linguistic age.

The results of McCarthy (10) on the length of response and sentence construction of preschool children are of interest here. She shows that the percentage of comprehensible responses increased rapidly with age; that the mean length of response shows an increase with chronological age, an increase which is more rapid at the younger age levels. A decrease was found in the relative proportion of the responses that were functionally complete but structurally incomplete. Compound and complex sentences appear late. The elaborated sentence appears in the upper ages and shows a marked increase with increase in chronological age.

McCarthy classed incomplete responses into six categories according to type of omission: (1) omission of verb; (2) omission of subject; (3) omission of preposition; (4) omission of conjunction;

(5) omission of verb and the subject; (6) miscellaneous omissions (itemized).

Boyd (2) also studied the number of principal clauses and subordinate clauses in the spontaneous conversation of a child from two to eight years of age. Although the simpler sentences continued to appear throughout the period, more sentences containing two or more principal clauses and also those containing in addition one or more subordinate clauses made their appearance as the child increased in age.

Fisher (6) found that simple, compound, complex, and compound-complex sentences appeared with advance in age in the order mentioned. Instances of each appeared as early as the third year with a very small proportion of them occurring throughout the remaining two years studied. Incomprehensible and incomplete sentences decreased inversely with age.

Sentence length has an indirect bearing on this study to the extent that complex, compound, and compound-complex sentences are necessarily longer than simple sentences. The addition of modifiers also increases sentence length. Conjunctions make possible the combining of related thoughts into one sentence. It would seem that including all these parts under the topic of sentence length is much too broad a classification and needs breaking into its parts to indicate more clearly developmental progression.

Nice (12) points out four stages of development based entirely on sentence length.

Little is known about the growth of the inflections of verbs. Boyd (1), however, noticed that at the age of two the child's speech showed frequent omissions of grammatical inflections. Special consideration was given inflections of words by the Child Study Committee of the International Kindergarten Union (3) because it was decided that each inflection meant a shift of some kind in the thought of the child. The same implication can be made concerning the comparison of adjectives and adverbs. Comparative forms are as essentially the acquisition of new language patterns as are verb inflections and should be given special consideration.

Smith's (15) treatment of grammatical errors in the speech of preschool children has been quite suggestive here, aiding in the preliminary placement of items according to difficulty and in pointing out aspects of grammatical construction that give particular difficulty to children of various ages.

She found that baby words and symbols persist in usage at the very youngest ages. Incomplete sentences were numerous at the two year level—the copula being omitted most frequently. The use of the proper auxiliary and the proper tense of verbs constituted the verb errors most commonly found. Forming plurals in nouns and using the right case in pronouns caused a number of errors. The article appeared late and prepositions were often omitted.

Speech Sounds

Speech sounds, as being an essential part of the oral mechanics of language, have been included in this study. Several investigators have been experimentally interested in this feature of language development.

Morrison (11) made a study of the speech habits of 218 children attending kindergarten and first primary classes. Words containing all the common combinations of consonant sounds both as initial and final elements were elicited from the child by means of pictures. Six consonant sounds and consonant blends were found to give difficulty. These are s, th, r, l, ch, and sh. When these sounds were pronounced correctly in words and the child was asked to repeat them as best he could, practically none of the sounds were pronounced correctly simply from hearing the correct form.

Lukens (9), writing in 1895, recognized the varying difficulty of sounds and made a list of consonant sounds and consonant blends, recording the ages at which these sounds were mispronounced.

Pool (13), testing children's ability to make consonant sounds, found four factors influencing such development: (1) audition, (2) kinaesthetic sensory discrimination, (3) motor exercise, and (4) dentition. Children who made sounds practically perfectly before the time they began to lose their baby teeth developed inaccuracies in making some of the sounds at this time, though they regained correct enunciation when the teeth had been replaced.

Wellman, Case, Mengert, and Bradbury (15) in their study of speech sounds showed the children pictures designed to elicit sounds in their various positions in any given word. One hundred thirty-three sounds, including consonant elements, consonant blends, vowels, and diphthongs, were tested and the relative difficulty of the different sounds was determined through the percentage of children giving correct responses on each sound as a whole and

by age groups. The relative difficulty of the sounds as determined in this study was used for the construction of this unit in the present test.

Intelligibility

The area of the scale dealing with intelligibility of language seemed worthy of inclusion as was indicated by a study carried out by Williams (17) in which oral mechanics were found to necessitate consideration quite apart from grammatical construction and vocabulary.

Construction of the Scale and Scoring

In constructing the present scale, use was made of the findings of the previously mentioned studies. Other items probably indicating growth were also added.

The portion of the scale dealing with speech sounds was based on the study by Wellman, Case, Mengert, and Bradbury (16). For this purpose eighty-five of the one hundred thirty-three speech sounds in that study were used. This was the number remaining after the medial position and certain regional peculiarities were eliminated, and after the inclusion of only those sounds occurring in the 1a and 1b words of the International Kindergarten Union list (3). This, then, is a list of high validity on the basis of frequency of use, and may be used entire by those wishing a more complete check-up on a given child's mastery of speech sounds. This list was divided into seven steps according to difficulty as determined by the per cent of children completely tested giving the sounds correctly in the study referred to (16).

Any three sounds given correctly in one of the seven levels of difficulty yielded one point for speech sounds. Seven points constituted the maximum score a child could receive in this area.

A tabulation of these speech sounds according to difficulty is given below:

1	2	3	4	5	6	7
t–	ʌ	ju	ʍ–	ʒ	kr–	skw–
p–	–b	tw–	–z	–d	sk–	θ–
i	–n	aɪ	tr–	sm–	pr–	ð–
f–	–d	ɔ:	gr–	–s	gl–	sl–
n–	aʊ	dʒ–	fr–	r–	–l	–ld
m–	g–	kw–	l–	kl–	br–	spl–
b–	–mp	–ks	dr–	st–	pl–	–st

u	k–	–nt	tʃ–	–tʃ	z–	–lk
h–	–p	–ns	s–	str–	–lf	–θ
d–	–f	ɪ	sp–	sn–	bl–	–nd
ʊ	–g		–v	sw–	v–	θr–
ɔɪ	–k		ʃ–		fl–	
–m	–t				–ʃ	
	ɛ:					

A measure of the intelligibility of children's responses was found by Williams (17) to be relatively independent of sentence structure. He found that a sampling of fifty syllables had a predicted reliability of .94. This number of syllables was then taken as a sampling of the child's intelligibility in speech. On each syllable two points were scored if the syllable was pronounced correctly; one point if the syllable was intelligible to an observer not familiar with the child's idiosyncracies but incorrect; and zero if the syllable was not intelligible. The total score on intelligibility was divided by ten, giving a maximum score of 10 in this unit if all syllables were correct and intelligible. In this scoring, pronunciation consistent with adult norms in the child's own region was counted correct.

The third area of the scale covers items appropriate to the infant level and items related to sentence organization. It is composed of fifty-two items arranged tentatively into a sequence of difficulty, each item denoting some presumably significant progression in language achievement.

The English grammar entitled *Writing and Thinking* by Foerster and Steadman (7) furnished the basis for the judgment of the correctness of grammatical forms and the definition of parts of speech. A Standard Webster's Dictionary was also used.

Table 1 presents a tentative analysis of these items.

For the purposes of the present study credit was given on the achievement rather than the error basis, the interest being primarily in this aspect of development. This necessity involves to some extent the assumption that if a child can show achievement on one item he will show the same achievement in other analogous situations. That this assumption is questionable is admitted, and this should be borne in mind in the interpretation of the results. In the opinion of the writers the achievement aspect of development in these early years when all of the language skills are in emergent form is definitely more significant than the error aspect.

Table 1
Definition and Analysis of Each Item Included in Organization and Per Cent of Total Group Succeeding

Item	Definition	Achievement Denoted	Per Cent Succeeding
(1) Vocalizes spontaneously	Any vocalization other than crying, generally vowels	This is the first spontaneous use of the voice in any form other than crying. It marks the primal step in the use of vocalization.	99
(2) Attends to vocal stimulation	Watches the person vocalizing intently, turns eyes or head toward person	The child shows recognition of vocalization other than his own.	99
(3) Laughs aloud	"Crowing"	Connection has been made between vocalization and the expression of feeling.	97
(4) Vocalizes well-defined syllables	Syllables initiated by a consonant	Previously the vocalization consisted of vowels and vowel combinations only while now consonant steps are used in combination to make a syllable.	98
(5) Responds vocally to vocal stimulation	Vocalizes in response to being talked to	By advancing to this step the child shows not only recognition of the vocal stimulation as in step two but also a response in a related manner. Vocal response is associated with vocal stimulation.	97
(6) Responds to vocalization and gesture of picking up	Definite reaching out of arms, or other appropriate demonstration by infant when an adult makes motions toward picking child up	In this step a specific vocalization and gesture have been associated with a specific act.	96
(7) Attempts to imitate sound	Recognizable likeness between sound stimulus and response	In accomplishing this response the child shows a recognition of and the ability to reproduce differing sounds. Control of the sound mechanisms is beginning.	95

Table 1 (Continued)
Definition and Analysis of Each Item Included in Organization and Per Cent of Total Group Succeeding

Item	Definition	Achievement Denoted	Per Cent Succeeding
(8) Shows comprehension of verbal symbol	Comprehension may be shown by the child's carrying out a command or suggestion	In this step the gesture has been omitted and only vocalization is given as the stimulus.	95
(9) Uses final consonant stop in syllables	Initial and final consonant stop demonstrated in syllables isolated from one another by a space	The more difficult task of ending a syllable with a consonant as well as beginning it with a consonant has been accomplished.	90
(10) Repeats words in imitation	The child may not be able to use, know the meaning of, or comprehend what he is saying but repeats a word after hearing it from an adult	By responding to an example, the child is able to imitate the combination of syllables into acceptable words. The stimulus is introduced by another individual.	88
(11) Repeats voice inflection in imitation	Voice inflection follows that of the example set	Voice inflection is used in repeating the words thus adding one more complication.	88
(12) Responds vocally to frustration	Scolds when a coveted object has been taken away	The child attempts to express his emotions in a more accepted form than crying. An attempt is made to portray feeling.	89
(13) Uses vocal symbol to express meaning	The vocal symbol may represent a word or it may not, but it must be used consistently by the child and denote meaning to him as well as to the adult	A symbol has been associated by the child with a specific act, person, or thing. Independent expression and a definite step in conformance is here attained.	72
(14) Uses five symbols to express meaning	Same as (13)	The use of different symbols to convey different meanings has been achieved.	88
(15) Uses ten symbols to express meaning	Same as (13)	Fourteen expanded	83

(16) Uses two conventional words accurately	The words (as determined by the dictionary) must be understood and correctly pronounced	This is the first approach to accurate conformance to conventional standards of meaning and pronunciation. (The dictionary was used as the basis of determining words.)	83
(17) Uses six conventional words accurately	Same as (16)	Sixteen expanded	70
(18) Combines two words to express a meaning	Any two words or symbols combined to express a meaning	This step shows recognition of the fact that two words express a more complete meaning than one. Two units are combined; the expression is lengthened.	79
(19) Uses noun and verb combination	Demonstrates at least one use of a noun and verb combination	In the combination of a noun and verb an action word has been combined with a subject. Sentence structure is beginning.	66
(20) Definitely uses noun and verb pattern	Demonstrates at least three uses of a noun and verb combination	The use of three such forms indicates generalization and assures us that this pattern is well established.	63
(21) Uses noun, verb, object structure (2)	Demonstrates use of the noun, verb, object structure in two instances	By the achievement of this step it is indicated that the child is conscious of the fact that the subject can have an object involved in the action of the verb. The sentence is lengthened.	65
(22) Qualifies noun with adjective (2)	Uses an adjective to modify a noun	In a previous item the child's discovery that everything has a name was noted; now he finds that these names can be modified and differentiated.	48
(23) Qualifies verb with adverb (2)	Uses an adverb to modify a verb	It is learned that action, too can be qualified and further described.	46

Table 1 (Continued)

Definition and Analysis of Each Item Included in Organization and Per Cent of Total Group Succeeding

Item	Definition	Achievement Denoted	Per Cent Succeeding
(24) Uses regular plural nouns correctly	Uses any regular plural noun correctly	The child finds that he need not necessarily speak of only one thing at a time but by using the same word and varying it only slightly he can include many of the same things instead of one.	32
(25) Uses irregular plural nouns correctly	Uses any irregularly formed plural noun correctly	Some words do not fit into this general rule for making them designate more than one, but have a form of their own which needs to be learned. Generalization is a handicap here.	26
(26) Uses possessive in nouns	Any noun used correctly in the possessive form is credited	By advancing to this step the child has gained the conception that one person or thing can belong to another person or thing and that this can be expressed by a simple change in the form of the noun or person possessing. This possessing noun may have the same form as it would have if it were plural, yet it has a totally different meaning.	2
(27) Uses prepositions (2)	Demonstrates the correct use of two prepositions	Another part of speech has been added to the store which makes for clearer meanings.	55
(28) Uses article	Demonstrates the correct use of an article	Almost perfect meaning can be conveyed without the use of articles and for this reason they are adopted into the speech of the child rather late. The theory here might be that advance to this stage indi-	

		cates that the necessities of speech have been to some extent mastered and attention can now be given to other parts of speech that are not so vital.	48
(29) Uses pronouns (other than "I")	Uses a pronoun, other than "I"	A further mastery of conventions: substitution	62
(30) Uses pronoun with correct gender	Uses a pronoun, other than "I," in correct gender	Proper use of Step 29	62
(31) Uses pronoun with correct number	Uses a pronoun, other than "I," in correct number	Proper use of Step 29	62
(32) Uses pronoun with correct case	Uses a pronoun, other than "I," in correct case	Proper use of Step 29	62
(33) Uses comparison of adjectives	Heading (should not be numbered)		Not Scored
(34) Correct regular comparative	Uses the correct form of any regular comparative adjective	By attaining Step 22 the child had gained a conception of the qualifying of nouns; now, beyond that, it is found that these qualifiers can have different degrees of intensity.	14
(35) Correct irregular comparative	Uses the correct form of any irregular comparative adjective	The child shows that he realizes this intensity of comparison, and demonstrates its proper use.	10
(36) Correct regular superlative	Uses the correct form of any regular superlative adjective	Correct comparison of more than two things is demonstrated by the use of a conventional term.	11
(37) Correct irregular superlative	Uses the correct form of any irregular superlative adjective	If the child has generalized in using all comparatives, he now meets this new form to be mastered in order to make himself understood.	4

Table 1 (Continued)
Definition and Analysis of Each Item Included in Organization and Per Cent of Total Group Succeeding

Item	Definition		Not Scored
(38) Uses comparison of adverbs	Heading		
(39) Correct regular comparative	Demonstrates the correct use of any regular comparative adverb	Action modifiers are mastered in these steps as were object modifiers.	22
(40) Correct irregular comparative	Demonstrates the correct use of any irregular comparative adverb	Same as (39)	11
(41) Correct regular superlative	Demonstrates the correct use of any regular superlative adverb	Same as (39)	2
(42) Correct irregular superlative	Demonstrates the correct use of any irregular superlative	Same as (39)	2
(43) Uses co-ordinate conjunction	Demonstrates the correct use of a co-ordinate conjunction	A part of speech is here used which enables one to connect two things together when talking about them. Previously by using the plural the child spoke of many things, yet all necessarily in the same category, and now he is able to connect two totally different things in the same sentence: he can talk of them both at once; or he may join two complete sentences into one.	25
(44) Uses other than co-ordinate conjunction	Demonstrates the use of a conjunction other than a co-ordinate conjunction	A further mastery of conventions: subordination	21
(45) Uses compound sentence	Demonstrates the use of a compound sentence	Two related yet different thoughts are joined together into a unified expression. The child has begun to express himself in more	

		complex patterns and no longer clings to the simplest possible forms of expression. Two equal complete and related units are joined together in one expression.	20
(46) Uses complex sentence	Demonstrates the use of a complex sentence	Instead of just parallel and equal units being joined, one unit is subordinated to a major unit.	18
(47) Uses compound-complex sentence	Demonstrates the use of a complex sentence	This step is a combination of the two previous steps into one.	4
(48) Uses any other tense of verb than present	Credit is given for this item whether the use of another tense than present is correct or not when used	Recognition and expression of time relations are mastered.	31
(49) Uses past tense correctly	Demonstrates the correct use of the past tense	Same as (48)	22
(50) Uses future tense correctly	Demonstrates the correct use of the future tense	Same as (48)	17
(51) Uses past perfect tense correctly	Demonstrates the correct use of the past perfect tense	Same as (48)	0
(52) Uses future perfect tense correctly	Demonstrates the correct use of the future perfect tense	Same as (48)	0
(53) Uses conventional ellipsis	Uses a conventional ellipsis correctly such as: "don't" or "we'll"	Further mastery of conventions. Speech is being condensed.	39
(54) Uses auxiliary	Demonstrates the correct use of the auxiliary in sentences	This step resembles Step 28 in that almost complete meaning can be attained without the use of the auxiliary.	39

A double check is required for credit to be received in some of the items. This was done to guard against crediting merely chance usage. Over the entire scale there is a possibility of obtaining a total score of sixty-nine points.

Subjects

The subjects for this study included eighty-seven children in the preschool and ninety-one babies in the infant clinic of the Iowa Child Welfare Research Station and 107 children in both the preschool and control groups in the Iowa Soldiers' Orphans' Home at Davenport, 285 children in all. The children at the orphans' home were those enrolled during the two years, 1934-1935 and 1935-1936.

The age range of the entire group was from one month to eighty months. The range in the Iowa City group was from one month to seventy-four months, while the Davenport group ranged in age from twenty-three months to eighty months.

The infant clinic group included babies brought by the parents periodically for physical and mental measurements and examination. The data on these children were obtained by observation, supplemented by interviews with the parents.

The children in the orphans' home had been divided into two moderately equivalent groups on chronological and mental age, one group attending a preschool six hours a day while the other group, called the control group, remained in the cottage environment. Aside from this preschool experience the surroundings and treatment of the children in the two groups were the same.

Test Materials and Procedure

In a preliminary experiment a purely observational method was tried but proved unsatisfactory because it was found to be too time consuming and the recorder could not, without definitely intruding in the child's play, be sure of certain achievements of the child. Observation was therefore supplemented by tests on certain items.

Throughout the entire experiment, except for records taken on the Davenport children during 1934-1935 (which will be treated in further detail later), the children were taken into the experimental room two at a time. They were seated at a table and in front of each was placed a box containing blocks of various sizes and shapes, some colored and some plain, two small cars, a nest

of colored measuring cups (four in a nest), an unbreakable pitcher, and some colored measuring spoons. These items were chosen because of the wide age range of the children to be tested. A few children whose interest span in anything was short had to be given suggestions as to possible uses of the material.

The children were told to play with the things in any way they chose. During this free play with the materials, conversation between the two children in most cases flowed freely and records were taken at this time. The children were allowed to play twenty to twenty-five minutes in this manner before being interrupted. At the end of this period definite inquiry was made into the items that were not observed in the free play period.

The comparison of adjectives and adverbs, the use of the irregular plural, and some of the more difficult and less frequently heard sounds were the items most frequently needing check. For comparison of adjectives the cups in one nest were set up in a line, and after getting the child's attention, the experimenter said, touching the smallest cup, "This is the smallest cup, and this is———?" (touching the largest cup).

In order to get the comparative response, two of the cups were taken away leaving two cups of obviously differing size. The experimenter said, "This cup is larger than this cup, and this one is———?" (touching each cup as it was mentioned). Only the comparative was credited.

In order to check the irregular comparative and superlative in adjectives, a square block was used in play as a little house which had the possibility of one of three roofs. Each roof was tried and the child asked to choose which roof should go on the house. If the child merely designated one roof by pointing or describing, the question was asked, "Do you think this one looks as well as these?" The block chosen for the roof was taken away and a choice was then made between the two remaining possibilities. The correct answer in the first instance was to use the term "best" and in the second to use the term "better."

Any of these questions was asked a second or third time if it seemed the child did not understand. These are merely suggestive questions. In the suggested revision other techniques are described.

To see if the child could use the correct irregular plural in nouns, a question like this was asked, "One man and another man are two ——, what?" Other words used in place of man were "woman" and "child."

Pictures were also shown to elicit some of the more difficult and less frequently heard speech sounds and the regular and irregular forms of the comparison of adverbs. These pictures are on file at the Iowa Child Welfare Research Station, Iowa City, Iowa.

The first five of these pictures were used to elicit comparison of adverbs as well as to note the sounds used. Concerning picture 1, the question was asked, "Could you build a tower as tall as this one?" Of the picture of the boy and dog, the child was asked, "Is the dog going as fast as the boy?" The dog is ahead of the boy in this picture. In picture 3 the child was asked, "Is the little girl swinging as high as the little boy?" When the next picture was presented, that of the little girl swinging extremely high, it was placed near picture 3 and the question was asked, "Of all the children how is this little girl swinging?"

The comparison of the irregularly compared adverb "much, more, most" was given opportunity for use in connection with the picture of the children eating their breakfast. The question was asked, "Can you drink as much milk as this little boy?", or, "Can you eat as much cereal as this little boy?" Previous to this remark the child's attention was brought to the difference in his size and that of the child in the picture.

In eliciting the responses using the comparative adverbs, free talk between the subject and the experimenter was indulged in and any time it was thought that a question would bring out the desired response if it were known, it was asked. For example, a frequent response was, "Oh, I can build a tower as high as this room." The question was then asked, "Would that be as high as this tower?"

Where the child had demonstrated use of any items in the free play period, these test situations were only used as a check.

In the infant clinic group the mothers were asked to demonstrate the language responses, rather than to answer general questions of the form, "Can the baby ———." No credit was given where there was question as to whether the child could respond satisfactorily to an item. Where possible, the child's responses were observed directly. Since vocal behavior is one of the first things inhibited in a strange situation, it was not deemed feasible to attempt direct demonstrations of responses by the infant to all items.

The Davenport children of 1935-1936 were treated in the same way as were the children in the Iowa City preschools.

Phonetic transcripts of the language of children in both the

control and preschool groups at Davenport had been taken during the year 1934-1935 by Williams. These phonetic transcripts were evaluated in terms of the test as here described. Each sample from one individual consisted of forty expression units.

Reliability and Validity

The reliability of the experimenter was checked over the entire age range and found to correlate .97 ± .01 with that of another observer observing at the same time. Thirty cases were included here.

Two tests on twenty-eight children covering the age range of the older children used in this study correlated .98 ± .01. Those in the baby group were not used in determining this figure as it was impossible to get more than one record on a child on different days without the lapse of ten to twelve weeks. Williams (17) has shown that the phonetic transcript method was valid against objective recording and results from other observers; that the speech sounds test was shown to be valid against phonetic transcript; and that various elements of sentence development such as length, degree of complexity, and completeness were reliable with reasonably short samplings. These results have been utilized in the present study.

Experimental Results

The per cent of children succeeding on each item was calculated on the total group of 285 children. These per cents for the organization items are given in Table 1. The percentages for the various degrees of achievement in speech sounds and intelligibility are given in the following tabulation:

Speech Sound Level	Per Cent Succeeding	Intelligibility Level	Per Cent Succeeding
1	89	1	77
2	84	2	75
3	64	3	71
4	48	4	68
5	38	5	61
6	31	6	54
7	23	7	46
		8	38
		9	30
		10	19

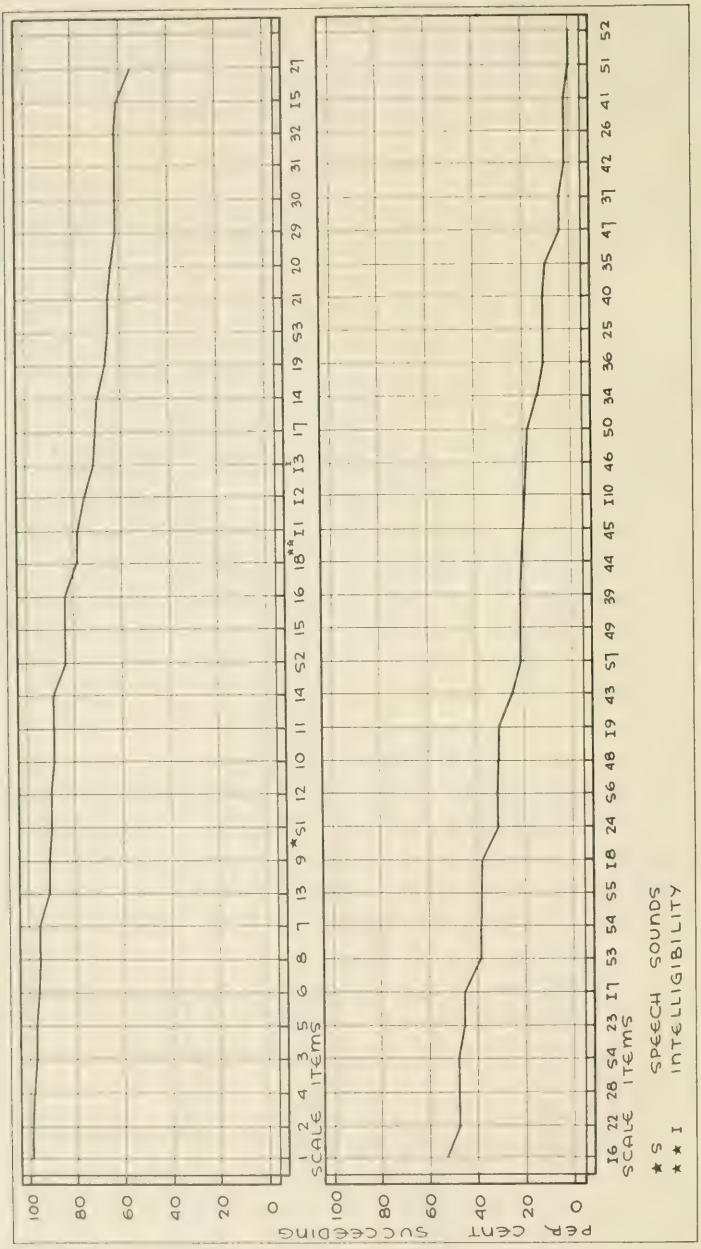

Figure 1. Revised Order of Difficulty of Test Items

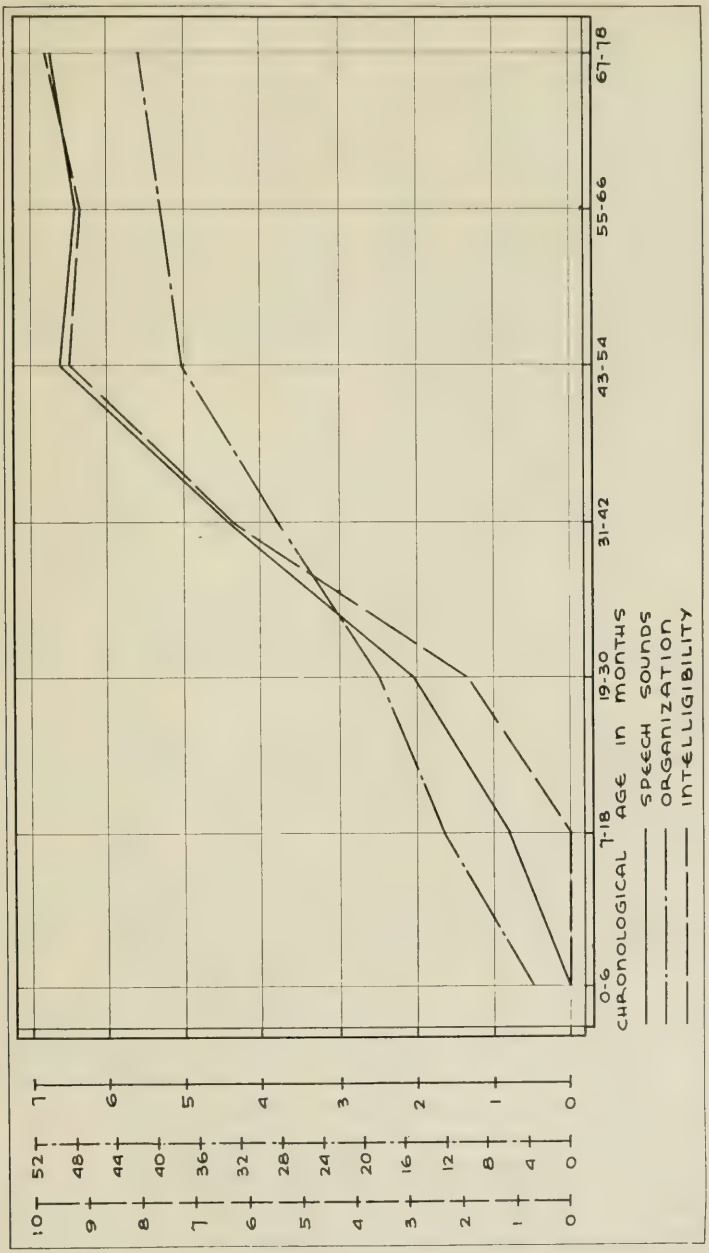

Figure 2. Chronological Age Growth Curves in Absolute Score for the Iowa City Children in the Areas of Speech Sounds, Organization, and Intelligibility

Figure 1 shows the revised order of difficulty of these items. This curve shows that the items in the organization unit were not arranged in the preliminary form in their exact order of difficulty. It will be seen that the items cover on these ages a range from nearly 100 per cent success to practically 100 per cent failure. The descent is quite gradual with some instances of equal difficulty.

Table 2 summarizes the scores as obtained by the Iowa City children in the three areas: "speech sounds," "intelligibility," and "organization" according to chronological age and sex. There is a general tendency for girls to score higher than the boys in all areas and at most age levels. This is in agreement with the results found in most studies where sex comparisons are made with regard to language development.

Figure 2 shows chronological age growth curves in absolute score for the Iowa City children in the areas of "speech sounds," "intelligibility," "organization," and the combined scores. These curves have been reduced to a comparable basis by equating the ordinate values for each area. According to these curves the development of language progresses quite rapidly and with comparatively even acceleration from birth up to forty-eight months, after which there is negative acceleration in all three of the aspects studied here.

Table 3 summarizes the results with mental age instead of chronological age as the basis. Here the cases begin at the seven to twelve months level because mental tests were not available on any children below this age. Practically the same tendencies are noted here as were noted in Table 2.

There is a tendency for the scores for the boys at the different age ranges to be higher than those for the girls more frequently on the mental age basis. The mean IQ for the Iowa City group was 111.

Table 4 gives the scores in the three areas of the test according to chronological age and sex of the orphanage group of children. Table 5 makes a similar comparison of the orphanage children according to mental age and sex in the three areas of the scale. The mean IQ for the orphanage children was 82.

In Figure 3 the growth curves in total absolute score according to chronological age and mental age in the Iowa City group and in the orphanage group are shown. Since in the case of the Iowa City children the IQ is higher than 100, the mental age curve runs

Table 2
Scores Obtained According to Chronological Age and Sex for Iowa City Children in Three Areas

Age, Months	Number			Speech Sounds			Intelligibility			Organization			Totals		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
0 to 6	7	3	10	0.0	0.0	0.0	0.0	0.0	0.0	3.7	3.7	3.7	3.7	3.7	3.7
7 to 18	24	15	39	.9	.7	.8	0.0	0.0	0.0	12.5	11.5	12.1	13.5	12.1	13.0
19 to 30	19	12	31	2.2	1.9	2.1	1.8	2.1	1.9	18.0	18.9	18.3	21.9	23.0	22.3
31 to 42	11	12	23	4.6	4.2	4.4	6.4	6.2	6.3	29.2	27.8	28.4	40.3	38.1	39.1
43 to 54	8	14	22	6.5	6.6	6.6	9.1	9.4	9.3	37.6	37.4	37.5	53.3	53.4	53.4
55 to 66	20	8	28	6.3	6.6	6.4	8.9	9.4	9.1	39.1	40.6	39.5	54.3	56.7	55.0
67 to 78	16	8	24	6.5	7.0	6.7	9.6	9.8	9.7	41.6	41.4	41.5	57.7	58.2	57.8

Table 3
Scores Obtained According to Mental Age and Sex for Iowa City Children in Three Areas

Age, Months	Number			Speech Sounds			Intelligibility			Organization			Totals		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
7 to 18	19	14	33	1.1	.7	.9	0.0	0.0	0.0	13.1	11.8	12.5	14.2	12.5	13.5
19 to 30	17	15	32	2.2	2.1	2.1	1.6	2.4	1.9	17.8	19.0	18.4	21.6	23.5	22.4
31 to 42	12	6	18	4.6	4.7	4.6	6.1	6.9	6.4	28.4	29.5	28.8	39.1	41.1	39.8
43 to 54	0	3	3	0.0	6.0	6.0	0.0	8.8	8.8	0.0	34.0	34.0	0.0	48.8	48.8
55 to 66	10	8	18	6.3	6.6	6.4	9.2	9.1	9.2	38.5	38.0	38.3	54.0	53.7	53.9
67 to 78	15	10	25	5.9	6.5	6.2	8.9	9.5	9.2	39.8	38.8	39.4	54.7	54.8	54.7
79 to 90	12	4	16	6.8	7.0	6.8	9.7	9.7	9.7	40.9	42.3	41.3	57.3	59.0	57.8
91 to 102	2	4	6	7.0	7.0	7.0	9.9	9.9	9.9	44.0	43.5	43.7	60.9	60.4	60.6

Table 4
Scores Obtained According to Chronological Age and Sex for Orphanage Children in Three Areas

Age, Months	Cases	Speech Sounds			Intelligibility			Organization			Totals		
		Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
19 to 30	11	2.0	1.9	1.9	2.5	1.9	2.0	16.0	16.3	16.3	20.5	20.2	20.2
31 to 42	45	2.5	3.0	2.7	3.2	3.9	3.5	20.9	23.9	22.2	26.6	30.8	28.4
43 to 54	41	4.2	3.2	3.8	6.4	4.8	5.7	29.8	27.3	28.7	40.5	35.3	38.3
55 to 66	36	4.1	5.1	4.5	6.0	7.2	6.5	29.8	32.5	30.9	38.5	44.8	41.1
67 to 78	18	5.2	5.7	5.3	7.5	7.3	7.4	30.9	31.7	31.2	43.6	44.6	43.9

Table 5
Scores Obtained According to Mental Age and Sex for Orphanage Children in Three Areas

Age, Months	Cases	Speech Sounds			Intelligibility			Organization			Totals		
		Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
19 to 30	48	2.3	2.3	2.3	2.9	2.8	2.8	20.0	20.1	20.0	25.2	25.2	25.2
31 to 42	38	3.1	3.5	3.3	5.3	5.1	5.2	26.5	26.9	26.7	35.0	35.5	35.2
43 to 54	42	4.6	4.3	3.5	6.7	6.7	6.7	30.6	31.0	30.7	41.9	42.0	41.9
55 to 66	21	5.2	5.7	5.4	7.2	7.1	7.2	32.4	32.8	32.6	44.8	45.6	45.2
67 to 78	3	6.0	6.0	6.0	7.5	7.9	7.8	29.0	36.0	33.7	42.5	50.0	47.5

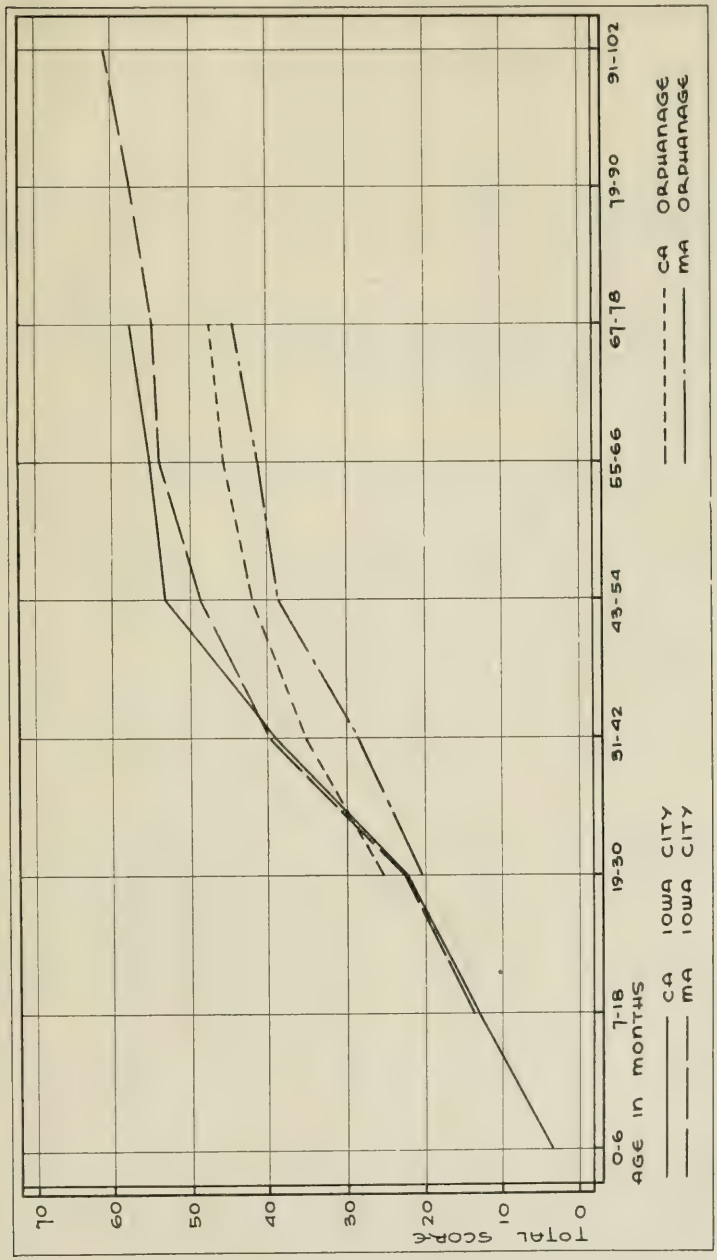

Figure 3. Growth Curves in Total Absolute Score According to Chronological and Mental Age in the Iowa City and Orphanage Groups

lower than the chronological age curve. The reverse is true in the case of the orphanage group when the IQ is less than 100. On a basis of absolute score there is an increasing divergence between the two groups.

Suggested Revision of Scale

The revision of the speech sounds unit presents a difficulty in that two uses of such a test may be desired: (1) use as a part of a general survey of language development and (2) a fairly complete inventory for diagnostic and remedial purposes. The decision reached regarding this question was to include in the general scale the speech sounds unit as described above, but to have available also the more complete test described in a previous article in this monograph (17).[1]

Because the decision regarding the point weight to be assigned to this unit had to be arbitrary, it was decided to retain the present weight of 7 points. Since the organization unit was shortened, this gives the speech sounds unit relatively greater weight than formerly. It must be remembered also that the intelligibility unit emphasizes the mechanics of speech so that the total weight to this factor is about one-third of the whole.

The unit on intelligibility is rapid in administration, reliable, and seems to the writers to be a decidedly useful element in the estimation of language achievement according to the concept presented here. It is therefore retained in its present form.

The organization unit required substantial revision. In the revision, the attempt at complete inventory was abandoned and a sampling of units of progressively increasing difficulty was substituted. The other criteria used in the selection of items to be retained were: ease and objectivity of administration and significance for language development *per se*. A discussion of the changes follows.

Item 3, "laughs aloud," has the same difficulty as item 4, "vocalizes well-defined syllables." The latter seemed to be the more meaningful and was the one retained.

Item 6, "responds to vocalization and gesture of picking up," is closely related to item 8, "shows comprehension of verbal symbol," but occurs at the same level as item 5, "responds vocally to vocal stimulation." It was found that parents had difficulty in

[1] The materials for this test are available in photographic form at the Iowa Child Welfare Research Station, Iowa City, Iowa.

distinguishing between gross body action on the part of the infant and signs of comprehension. Item 6 was therefore dropped.

Item 10, "repeats words in imitation," seems to be passed over by some children who are not willing to copy a pattern. For this reason it was dropped.

Item 11, "repeats vocal inflection in imitation," can advantageously be combined with item 7, "attempts to imitate sound," to read, "imitates sounds in pitch level or inflection," and this change was therefore made.

Item 12, "responds vocally to frustration," occurs at approximately the same level as items 10 and 11. Because parents exhibited some embarrassment when answering this, the item was dropped.

Item 16, "uses two conventional words accurately," was omitted for scaling reasons.

Item 18, "combines two words to express a meaning," was changed to read, "combines two words or symbols to express a meaning."

Item 19, "uses noun and verb combination," was omitted and item 20 retained on the former basis emphasizing the definiteness of usage (two examples).

Item 26, "uses possessive in nouns," appears spontaneously very seldom. Since it also proved to be difficult to elicit this response, it was omitted.

Item 28 was omitted because of its nearness in difficulty to other items.

Items 29, 30, 31, and 32 all dealing with pronouns yield the same level of difficulty. Since it appeared that when pronouns are used they tend to be used correctly and since two other items had the same difficulty rating, the items except 29 were omitted.

In comparison of adjectives item 34, "uses correct regular comparative," and item 36, "uses correct regular superlative," were retained because of the need for an item of those difficulty values. Items 35, "uses correct irregular comparative," and 37, "uses correct irregular superlative," were dropped for scaling reasons. In adverbs, only item 41, "uses correct regular superlative," was retained for the same reasons.

Item 53, "uses conventional ellipsis," has the same difficulty as item 54 and is therefore omitted. Item 44 was dropped, credit being given for any conjunction in item 43.

This reduces this part of the scale to 33 items. The present form

of the scale, with directions for use, is given in Appendix B. Where overlapping occurs, it was made in terms of different units of the scale if possible.

Summary and Conclusions

This study represents a preliminary attempt to analyze and scale language achievement of children from birth to six years of age. In fulfilling this major objective, several related interests present themselves, including the questions of sequence and relative difficulty of items, sex differences, chronological age and mental age differences, the development of tentative norms, and the effect of differing environments on language development.

The subjects of the study consisted of three groups: a preschool and clinic group in Iowa City and an orphanage group. The 285 children tested range in age from one month to eighty months.

The conversation of two children, while they were playing with material provided for the purpose in a testing room, was observed and scaled according to "speech sounds," "intelligibility," and "organization" as set forth on a score sheet. Pictures were also shown and questions asked to elicit some of the desired responses. This procedure was deviated from in the case of children under two years of age for whom the interview method was substituted; the parents were asked to demonstrate the child's vocal behavior. Approximately two-thirds of the orphanage children were scaled from phonetic transcript taken of conversation during a free play period.

The tentative scale consisted of a partial inventory of language skills as set forth in grammar textbooks. In addition the children were tested on speech sounds and intelligibility. Vocabulary was omitted because other tests are available for the measurement of the function.

The items chosen showed a gradation in difficulty in terms of the percentage of children at each age level scoring success on an item.

A small sex difference appeared in the Iowa City group in favor of the girls, but this was not as pronounced in the case of the orphanage group.

The small number of cases precludes making any definite statement of norms except for the special groups studied.

Below normal mental age accompanied by an orphanage environ-

ment appears to lower linguistic achievement at all ages included in this study. No conclusions are drawn regarding how much the retardation is due to lowered mental age and how much to environmental influences.

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APPENDIX A

A Manual for Revised Vocabulary Scale

General Directions

The vocabulary scale is set up at present on two sets of cards, Form I and Form II.[1]

The child is tested preferably in a quiet room, alone with the experimenter. It is recommended that only one form be given at a sitting. The cards are so arranged that each picture object is presented while the experimenter records the appropriate questions from the back of the preceding card. The A form of the questions only appears on the backs of these cards. As soon as the child has reacted, the examiner passes to the next A question.

It is well to begin somewhere near the point at which the child seems likely to react successfully and to work from this point upwards until five consecutive failures have been encountered. Considerable care should be exercised also in checking the lower limit at which failures cease, since the spread of the critical area is rather great in this scale.

The B questions are listed at the end of the set of cards in serial order and should be taken up in the same way. These questions are used only on words failed when presented in terms of the A questions. The central aim of the scale is to give the child every reasonable opportunity to show knowledge of the word. Definitions in terms of use, genuinely discriminative description, or genuinely characteristic interpretative gestures are acceptable. The standards in this respect to be adhered to should be similar to those employed on similar items in the Binet scale.

The usual precautions regarding rapport are somewhat more than usually important in this scale, since it tends to be rather monotonous and uninteresting. A test completed at a later time is more valid than a test forced through.

Scale Items

The list of questions for the scale items is given below. These should be adhered to quite strictly. This adherence is not difficult, since the statements are all listed on the cards in the standard set-up.

FORM I

1a *Pocket* "What is this that we carry things in?"

3a *Take* Hand child pencil. "Now I give you the pencil, and, now, (taking back the pencil) what do I do?"

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1 The original negatives for the photographic materials used for the scale are on file at the Iowa Child Welfare Research Station, Iowa City, Iowa. Sets of prints from these negatives are obtainable at cost. These prints may be mounted on 5″ x 7″ cards, and the necessary questions typed on the back of the cards. This manual and the scoring blanks are also available in mimeographed form. The other materials used are so common as to be obtained anywhere.

5a *Dish* Picture of dishes. "What are these?" (gesture across all dishes)

7 *Love* "Whom do you love?"

9a *Fish* Point to fish in picture, "What is this man holding up?"

11a *Mud* "What do you get on your shoes when the ground is wet?"

13a *Paint* (Picture of man painting house) "What is the man putting on the house?"

15a *Glove* (Picture of gloves) "What are these?" If answer is mittens, say, "What else do we call them?"

17a *Strawberry* (Colored picture of strawberries in box) "What are these in the box?"

19a *Splash* "When you throw a big stone in the water, what does the water do?"

21a *Stir* (Dish and spoon. Stir spoon in the dish.) "I'm playing I'm making a cake. What am I doing now?" If response is "Making a cake" or "going around" say "Yes, but what am I doing with the spoon?"

23a *Watermelon* (Colored picture of watermelon which has been cut open) "What is this?"

25a *Cane* (Picture of man with cane) Point to cane and say, "What does the man have in his hand?"

27a *Lion* (Picture of lion) "What is this a picture of?"

29a *Ditch* (Picture of wreck in which car has gone into the ditch) "See, here's a wreck. The car has gone off the road into the ....."

31a *Flash* (Flashlight) Wink it on and off. "What am I making the light do?" Follow with, "What else do you call it?"

33a *Freight* (Picture of freight train) "Here is a train of cars. Do you see all the different cars? What kind of train is it?" If answer is "choo-choo," etc., follow with "What else do we call this kind of train? It isn't a passenger train, is it? What kind of a train is it?"

35a *Check* (Single check filled out) "What is this?" Follow with, "When daddy wants to pay for something, sometimes he writes a ....."

37a *Spade* (Picture of shovel and spade) "See, this is a shovel." Point to spade. "What is this?" Follow with "What else do we call it?"

39a *Ocean* (Picture of steamship sailing on ocean) Point by broad gesture to water. "What is this the big ship is sailing on?" Follow with, "What do the big ships and steamers sail on?" "What else?"

41a$_1$ *Fountain* (Picture of girl drinking out of fountain) "What is the girl drinking out of?"

41a$_2$ (Picture of fountain pen) "What kind of pen is this?"

43a *King* (Picture of king sitting on throne) "What do we call this man who is sitting on the throne?"

45a *Week* "Today is ....." (Name day of week) "From today to next ..... is one ....., what?"

47a *Shingle* (Picture of man putting shingles on roof) "What do we call these little boards the man is putting on the roof?" Follow with, "What else do we call them?"

49a *Price* (Picture of store window in which price tags figure prominently) "See, here is a picture of a store window. What do we call these little cards that tell us how much a thing is?"

51a *Kangaroo* (Picture of a kangaroo) "What is this a picture of?"

53a *Prison* "Where do they put bad men who steal things?" Follow with, "What else do we call it?"

55a *Velvet* (Piece of velvet) "What kind of cloth is this?"

57 *Easily* "Tell me something that you could carry easily." (Emphasize the word *easily*.)

59a *Pebble* (Actual pebble) "What is this?" Follow with "What else do we call it?"

61a *Delivery* (Picture of delivery man with groceries standing beside his truck) "What do we call this man who brings things to your house?"

63 *Rot* "What rots?"

65 *Cider* "What is cider?"

67 *Shabby* "What does shabby mean?" Follow with, "When is a thing shabby?"

69 *Stylish* "What does stylish mean?" Follow with, "When is a thing stylish?"

71a *Scum* (Picture of man pulling scum off cocoa with spoon) "What is the man taking off the top of his cocoa?"

73 *Bargain* "What is a bargain?" Follow with "Tell me about a bargain."

75a *Wampum* "What is wampum?"

77a *Cog* (Picture of cog wheels) "What kind of wheels are these?" Follow with, "What else do we call them?"

79a *Niece* (Picture of woman with little girl) "This is the little girl's auntie. She is her auntie's little ....." Follow with, "What else do we call it?"

81 *Defeat* "What does defeat mean?"

83a *Arbor* (Picture of arbor in garden) "Here is a picture of a garden." Point to arbor. What do we call this frame the vine is growing on?" Follow with, "What else do we call it?"

1b *Pocket* "Show me your pocket. Do you have a pocket?"

3b *Take* Hand child small car. "Now give it to me. Now take it."

5b *Dish* "What is a dish for?"

9b *Fish* "What is a fish? What do fishes do?"

11b *Mud* "What must you do when you get mud on your shoes?" Follow with, "Tell me where you get mud." If child says shoes, "Yes, but, where do you *get* the mud?"

13b *Paint* "What do you do when you paint?" Follow with, "Show me something that has paint on it."

15b *Gloves* "What are gloves for?"

17b *Strawberries* "What are strawberries?" Follow with, "Tell me about strawberries."

19b *Splash* "Where do you splash?" Follow with, "Tell me how you splash."

21b *Stir* "Show me how you stir things."

23b *Watermelon* "What is a watermelon. Tell me about a watermelon."

25b *Cane* "What is a cane?" Follow with, "Tell me about a cane."

27b *Lion* "What is a lion?" Follow with, "Tell me about a lion."

29b *Ditch* "What is a ditch?" Follow with, "Tell me about a ditch."
31b *Flash* "What is a flash?" Follow with, "Tell me about a flash."
33b *Freight* "What is a freight?" Follow with, "Tell me about a freight."
35b *Check* "What is a check for?" Follow with, "Tell me about a check."
37b *Spade* "What is a spade?" Follow with, "What is a spade for?"
39b *Ocean* "What is an ocean?" Follow with, "Tell me about an ocean."
41b *Fountain* "What is a fountain?" Follow with, "Tell me about a fountain."
43b *King* "What is a king?" Follow with, "Tell me about a king."
45b *Week* "What is a week?" "Tell me some of the days of the week."
47b *Shingle* "What are shingles for?"
49b *Price* "What do you want to know when you say, 'What is the price of this?' "
51b *Kangaroo* "What is a kangaroo?" Follow with, "Tell me about a kangaroo."
53b *Prison* "What is a prison?" Follow with, "Tell me about a prison."
55b *Velvet* "What is velvet?" Follow with, "What do you do with velvet?"
59b *Pebble* "What is a pebble?" Follow with, "Tell me about a pebble."
61b *Delivery* "What does the delivery man do?" Follow with, "Tell me about the delivery man."
63b *Rot* "What do things do when they rot?"
65b *Cider* "What is cider?" Follow with, "Tell me about cider."
71b *Scum* "What is scum?" Follow with, "Tell me about scum."
79b *Niece* "What is a niece?" Follow with, "Tell me about a niece."
83b *Arbor* "What is an arbor?" Follow with, "Tell me about an arbor."

FORM II

2a *Button* (Show button) "What is this?"
4 *Mine* (Touch child's clothing) "Whose dress or suit is this?"
6a *Window* (Point to window) If covered by curtain, touch glass and ask, "What is this, that you can see out of?"
8a *Too* (Try to put pencil in very small box) "Why won't the pencil go in? Because it is ....." Follow with, "The box is ....."
10a *Dry* "When your dress (suit) is wet you have to hang it up until it gets ....."
12a *Corn* (Colored picture of corn) "What is this?"
14a *Gun* (Picture of man with gun) "What does the man have in his hand?"
16 *Closet* "What is a closet for?"
18a$_1$ *Gas* (Picture of car at gas station) "What is the man putting in the car?"
18a$_2$ (Picture of gas stove) "What kind of stove is this?"
20 *Those* (Point to cards which have not yet been looked at and say, "Now we are going to look at these cards. We are all through with ....." (Indicating the cards which have just been seen)
22a *Kettle* (Picture of cooking utensils) Point to kettle. "What do we call this?" Follow with, "What else do we call it?"
24a *Blue* (Piece of blue paper) "What is the name of this color?"

26 *Edge* "Show me the edge of the table. Show me the edge of the card."

28a *Soldier* (Picture of soldiers drilling) "What do we call these men?" Follow with, "What else do we call men who are dressed this way?"

30a *Race* (Picture of men running a race) "See, these men are running a ....." Follow with, "This man is trying to beat that one. They are running a ....."

32 *Thin* (Two pieces of paper, alike in texture but one thick and one thin) "Here are two pieces of paper. Show me the thin one." Put down another pair like the first one but with the positions reversed. "Which one of these is the thin one?" Passed if the child indicates the correct one on both trials.

34 *Chilly* "What do you do when you are chilly?"

36 *Saturday* "Tell me about Saturday." Follow with, "What do you do on Saturday?"

38a *West* "That side of the room is east and this side is ....." Follow with (pointing in the correct directions), "North, south, east, and ....."

40a *Pave* (Picture of a paved road) "What did they do to this road so that it wouldn't get muddy?"

42 *Jerk* Hand child piece of string. "Will you hold this string for me? Now jerk it." Follow with, "Show me how you jerk your head."

44a *Camera* (Picture of camera) "What is this?" Follow with, "Yes, but what else do we call it?"

46a *Postal* (U.S. post card) "What kind of card is this?" Follow with, "What else do we call this kind of card?"

48 *Howl* "What howls?" Follow with, " Show me how you howl?"

50a *Twins* (Picture of nurse holding twin babies) "See the two little babies. They are just the same age and they look just alike. So we call them ....., what?"

52a *Necklace* (Picture of girl with necklace) "What is the girl wearing around her neck?"

54a *Orchard* "What do they call the place where a lot of apple trees grow?"

56a *Sailor* (Picture of boy with sailor suit) "What kind of suit is the little boy wearing?"

58a *Guard* "What do they call men who keep people from running away from jail?" Follow with, "What else do they call them?"

60a *Brownie* (Pictures of brownies) "What do we call these?" Follow with, "What else do we call them?"

62a *Colt* (Picture of mother horse with colt) "This is a mother horse and her little baby ....." Follow with, "What else is a baby horse called?"

64 *Moisture* "What is moisture?"

66 *Rumple* "What does rumple mean?" Follow with, "What gets rumpled?"

68 *Ornament* "What is an ornament?" Follow with, "What are ornaments for?"

70a *Skull* (Picture of skulls) "What are these pictures of?" Follow with, "What else do we call them?"

72 *Flesh* "What is flesh?" Follow with, "Show me your flesh."
74a *Pillar* (Pictures of building with large pillars) "What are these on the front of the building?" Follow with, "What else do we call them?"
76 *Pulse* "Where is your pulse?" Follow with, "Show me where you can feel your pulse."
78 *Hawthorne* "What is hawthorne?"
80a *Tortoise* (Picture of a tortoise) "What is this a picture of?" If answer is "turtle" follow with, "What else do we call this kind of a turtle?"
82 *Herd* "What is a herd?" "Tell me about a herd."
84 *Execute* "What does execute mean?"
2b *Button* "Can you show me a button?" Follow with, "Where is a button?"
4b *Mine* Indicate own coat or dress, saying, "This coat is mine." Indicate article of clothing on child, saying, "Whose is this?"
6b *Window* "Show me the window."
10b *Dry* "Is your dress (suit) dry or wet?"
12b *Corn* "What is corn for?" Follow with, "Tell me about corn."
14b *Gun* "What is a gun for?" Tell me about a gun."
16b *Closet* "What is a closet for?" Follow with, "Tell me about a closet."
18b *Gas* "What is gas for?" Follow with, "Tell me about gas."
22b *Kettle* "What is a kettle for?" Follow with, "Tell me about a kettle."
24b *Blue* (Red, yellow, blue, and green paper strips pasted on a card) "Show me the blue one." Change position of card and say, "Now show me the blue one." Passed if the child chooses correctly and with little hesitation on both trials.
28b *Soldiers* "What do soldiers do?" Follow with, "Tell me about soldiers."
30b *Race* "What do you do when you race?" Follow with, "Tell me about a race."
40b *Pave* "What do people do when they pave something?" Follow with, "Pave." "What do people pave?"
44b *Camera* "What is a camera for?" Follow with, "Tell me about a camera."
46b *Postal* "What is a postal?" Follow with, "Tell me about a postal."
50b *Twins* "What are twins?" Follow with, "Tell me about twins."
52b *Necklace* "What is a necklace for?" Follow with, "Tell me about a necklace."
54b *Orchard* "What is an orchard for?" Follow with, "Tell me about an orchard."
56b *Sailor* "What is a sailor?" Follow with, "Tell me about a sailor."
58b *Guard* "What are guards for?" Follow with, "Tell me about guards."
60b *Brownie* "What are brownies?" Follow with, "Tell me about brownies."
62b *Colt* "What is a colt?" Follow with, "Tell me about a colt."
70b *Skull* "Show me your skull."
72b *Flesh* "Show me your flesh."
74b *Pillar* "What are pillars for?" Follow with, "Tell me about pillars."

80b *Tortoise* "What is a tortoise?" Follow with, "Tell me about a tortoise."

Norms

Age at par scores, derived by the Thurstone scaling technique, are given below for the items for which such scores were calculable.[1] These data are based on 364 tests of preschool children in Iowa City. The scores represent total points earned by the child on the complete scale (both forms). No half-credits are allowed in these standards. The score points on either form alone should be multiplied by two.

Score Points (Whole Test)	Age at Par, Months	Score Points (Whole Test)	Age at Par, Months
16	27	40	43
17	29	41	44
18	30	42	45
19	30	43	46
20	31	44	46
21	31	45	47
22	31	46	48
23	32	47	50
24	33	48	52
25	33	49	53
26	35	50	54
27	37	51	55
28	38	52	56
29	39	53	57
30	39	54	58
31	39	55	59
32	40	56	59
33	41	57	61
34	41	58	62
35	41	59	63
36	41	60	64
37	42	61	66
38	42	62	66
39	43	63	70

[1] Thurstone, L.L.: A Method of Scaling Psychological and Educational Tests. J. Educ. Psychol., 1925, 16, 433-451.

H. M. Williams
Form 1, 1933

Iowa Child Welfare Research Station
State University of Iowa

SCORE SHEET: S-W VOCABULARY TEST: LIST I

Child ..... Date..... Age..... Date of Birth.....
Experimenter..... Total Correct..... Vocabulary Estimate.....

1. pocket
a.
b.
3. take
a.
b.
5. dish
a.
b_1.
b_2.
7. love
a.
b.
9. fish
a.
b_1.
b_2.
11. mud
a.
b.
13. paint
a.
b_1.
b_2.
15. glove
a_1.
a_2.
b_1.
b_2.
17. strawberry
a.
b_1.
b_2.
19. splash
a.
b.
21. stir
a_1.
a_2.
b.
23. watermelon
a.
b_1.
b_2.
25. cane
a.
b_1.
b_2.
27. lion
a.
b_1.
b_2.
29. ditch
a.
b_1.
b_2.
31. flash
a_1.
a_2.
b_1.
b_2.
33. freight
a_1.
a_2.
b_1.
b_2.
35. check
a_1.
a_2.
b_1.
b_2.
37. spade
a_1.
a_2.
b_1.
b_2.
39. ocean
a_1.
a_2.
a_3.
b_1.
b_2.
41. fountain
a_1.
a_2.
b_1.
b_2.
43. king
a_1.
a_2.
b_1.
b_2.
45. week
a.
b_1.
b_2.
47. shingle
a_1.
a_2.
b_1.
b_2.
49. price
a.
b.
51. kangaroo
a.
b_1.
b_2.
53. prison
a_1.
a_2.
b_1.
b_2.
55. velvet
a.
b_1.
b_2.
57. easily
a.
b_1.
b_2.
59. pebble
a_1.
a_2.
b_1.
b_2.
61. delivery
a.
b_1.
b_2.
63. rot
a.
b.
65. cider
a_1.
a_2.
b_1.
b_2.
67. shabby
a_1.
a_2.
b_1.
b_2.
69. stylish
a_1.
a_2.
b_1.
b_2.
71. scum
a_1.
a_2.
b_1.
b_2.
73. bargain
a_1.
a_2.
b_1.
b_2.
75. wampum
a.
b_1.
b_2.
77. cog
a_1.
a_2.
b.
79. niece
a_1.
a_2.
b_1.
b_2.
81. defeat
a_1.
a_2.
b.
83. arbor
a_1.
a_2.
b_1.
b_2.

H. M. Williams
Form 2, 1933

Iowa Child Welfare Research Station
State University of Iowa

SCORE SHEET: S-W VOCABULARY TEST: LIST II

Child ..... Date..... Age..... Date of Birth.....

Experimenter..... Total Correct..... Vocabulary Estimate.....

2. button
a.
b.
4. mine
a.
b.
6. window
a.
b.
8. too
a.
b.
10. dry
a.
b_1.
b_2.
12. corn
a.
b_1.
b_2.
14. gun
a.
b_1.
b_2.
16. closet
a_1.
a_2.
b_1.
b_2.
18. gas
a_1.
a_2.
b_1.
b_2.
20. those
a.
b.
22. kettle
a_1.
a_2.
b_1.
b_2.

24. blue
a.
b.
26. edge
a_1.
a_2.
b.
28. soldier
a_1.
a_2.
b_1.
b_2.
30. race
a_1.
a_2.
b_1.
b_2.
32. thin
a_1.
a_2.
b.
34. chilly
a_1.
a_2.
b.
36. Saturday
a.
b_1.
b_2.
38. west
a.
b.
40. pave
a.
b.
42. jerk
a_1.
a_2.
b.
44. camera
a_1.
a_2.
b_1.
b_2.

46. postal
a_1.
a_2.
b_1.
b_2.
48. howl
a_1.
a_2.
b_1.
b_2.
50. twin
a_1.
a_2.
b_1.
b_2.
52. necklace
a_1.
a_2.
b.
54. orchard
a_1.
a_2.
b_1.
b_2.
56. sailor
a_1.
a_2.
b.
58. guard
a_1.
a_2.
b_1.
b_2.
60. brownie
a_1.
a_2.
b.
62. colt
a_1.
a_2.
b_1.
b_2.

64. moisture
a_1.
a_2.
b_1.
b_2.
66. rumple
a_1.
a_2.
b.
68. ornament
a_1.
a_2.
b_1.
b_2.
70. skull
a_1.
a_2.
b.
72. flesh
a_1.
a_2.
b.
74. pillar
a_1.
a_2.
b_1.
b_2.
76. pulse
a_1.
a_2.
b.
78. hawthorne
b.
80. tortoise
a_1.
a_2.
b_1.
b_2.
82. herd
a.
b_1.
b_2.
84. execute
b.

APPENDIX B

A Manual for the Language Achievement Scale

Directions for Administering

A sample blank for facilitating the scoring of the scale is given on page 93.[1]

It is the intention of the scale that every item be checked by a trained experimenter from the child's actual behavior. In the earlier items this is manifestly difficult and the report of an informant intimately familiar with the child may be used. Where the informant can elicit a required response from the child, this can be made the basis of judgment. Where this fails, the informant can be asked to particularize. This method is useful, especially in the vocabulary items, where the questions normally should be: "What words does ..... know?" "How does he say them?"—credit being given according to the number proffered by the informant.

Most of the other items can be rather quickly judged from the child's spontaneous speech. Special techniques are suggested for a few of the items most difficult to elicit. An item not observed but falling below a range of five consecutive successes is credited as a success, above a similar range as a failure. The score in the organization unit is the total number of items credited.

Specific errors, either in sound groups or in grammatical forms, are overlooked if the child has met the requirement otherwise.

Credit for speech sounds is given only when the child is definitely attempting the conventional. Babbling gets no credit. Check may be made from spontaneous speech or from a set of test pictures. A fairly rigorous standard of correctness (except for regional peculiarities) should be adhered to. It is most convenient to check sounds as heard until the requisite number is found. Errors may be encircled. This check is particularly useful near the child's upper limit. An alternative method is to record a sampling of sounds as given by the child, scoring later according to the guide list on the blank. The score is the highest level achieved by the child. The whole list may be used as an inventory of principal speech sounds if desired.

Intelligibility is most conveniently checked by the use of the special blank, filling the sample of fifty syllables thus:

2 = perfect or near perfect pronunciation
1 = imperfect but recognizable
0 = meaningless

Scores are assigned on the basis of the import of the child's attempts being intelligible to a trained observer not familiar with the child. The score is the sum of these values divided by 10. Values 1 to 1.9 count as 1, etc.

The total score is the sum of the three scores thus derived. This gives to organization a weighting approximately twice that of the other two units

[1] These blanks are available at cost in offset process form by application to the Iowa Child Welfare Research Station, Iowa City, Iowa. Directions and point scores are also available in manual form (mimeographed).

combined. As in other scales of this kind, it is economical to begin at a level suggested by preliminary observation and work upward and downward until consecutive successes and failures are definitely established. The assignment of any form of half credits in the middle range seemed undesirable in this test.

Item Description of Scale

Former Number	Item	Description
1	1. Vocalizes spontaneously	"Babbling" or other spontaneous vocal activity other than crying
2	2. Attends to vocal stimulation	Definitely attends to vocal stimulation by turning head toward or watching person vocalizing
4	3. Vocalizes well-defined syllables	Uses syllables consisting of consonant and vowel in spontaneous vocal activity
5	4. Responds vocally to vocal stimulation	Vocalizes in response to being talked to
8	5. Shows comprehension of vocal symbol	Comprehension is shown by some specific and consistent response to verbal stimulation, waving "bye-bye" on demand, etc.
13	6. Uses vocal symbol to express meaning	Symbol must be vocal, but need not be conventional; must be consistently used by child, such as saying "ba-ba" for "goodbye," etc.
9	7. Uses final consonant in syllables	This may occur in verbal play or in child's efforts to reproduce speech
7	8. Imitates sound in pitch or inflection	Definite likeness to stimulus required in immediate imitation, either in pitch placement or inflection; mews like a cat, barks like a dog, etc.
14	9. Uses five symbols to express meaning	As in item 6
S_1	S_1. Achieves first level in speech sounds	Three sounds from the first level of difficulty fairly correctly given in approximations to conventional words; credit *d* in "da-da" for "daddy," etc.
15	10. Uses ten symbols to express meaning	As in item 6
S_2	S_2. Achieves second level in speech sounds	As in item S_1
18	11. Combines two words or symbols to express meaning	Two separate vocalizations, such as "bye-bye car," "Here daddy," required in one instance

Former Number	Item	Description
I_1	I_1. Achieves first level of intelligibility	A score of 1 to 1.9 on the intelligibility unit required
I_2	I_2. Achieves second level of intelligibility	As in item I_1
I_3	I_3. Achieves third level of intelligibility	As in item I_1
17	12. Uses six conventional words accurately	The words must be conventional. Infantilisms and symbols not conventional but understood by those familiar to child not accepted. Pronunciation need not be perfect, but word must be intelligible to one unfamiliar to child.
I_4	I_4. Achieves fourth level of intelligibility	As in item I_1
S_3	S_3. Achieves third in speech sounds	As in item S_1
21	13. Uses agent-action or action-object structure	One emergent use of pattern involving expression for action and expression for agent or object required; "ride car," "hurt baby," etc.
20	14. Definitely uses noun-verb or verb-object structure	Shows definite generalization of the patterns required by more than one instance. Examples: "get wagon," "dolly cry," "dog bark," etc.
29	15. Uses pronouns other than first person	Shows by more than one instance substitution of pronoun for use of other person's name
I_5	I_5. Achieves fifth level of intelligibility	As in item I_1
27	16. Uses prepositions	Shows by more than one instance use of this form. The principal emergence to look for is appearance of form in phrases usually previously truncated, as "go to town" in place of "go town," "ride in car" in place of "ride car," etc.
I_6	I_6. Achieves sixth level in intelligibility	As in I_1
22	17. Qualifies noun with adjective	The essential emergence to look for is a definite recognition of qualification of nouns, "pretty dress," "bad boy," etc.

Former Number	Item	Description
S_4	S_4. Achieves fourth level in speech sounds	As in item S_1
23	18. Qualifies verb with adverb	Any qualification of mode of action. See item 17.
I_7	I_7. Achieves seventh level in intelligibility	As in item I_1
54	19. Uses auxiliary in verbs	Any use of auxiliary accepted, including contractions. See item 16.
S_5	S_5. Achieves fifth level in speech sounds	As in item S_1
I_8	I_8. Achieves eighth level in intelligibility	As in item I_1
24	20. Uses regular plural correctly in nouns	More than one instance required to show generalization of *s* ending in plural
48	21. Uses any other tense of verb than present	Recognition and verbal form denoting differentiation to past or future must be clear; form need not be correct
I_9	I_9. Achieves ninth level in intelligibility	As in item I_1
43	22. Uses conjunction	Any definite use of connection of two things by conjunction, "and," etc. accepted
S_7	S_7. Achieves seventh level in speech sounds	As in S_1
49	23. Uses past tense correctly	Uses regular past forms correctly in more than one instance
45	24. Uses compound sentence	A definite instance of joining two related statements, best shown by use of conjunction. Mere serial order not accepted
I_{10}	I_{10}. Achieves tenth level in intelligibility	As in item I_1
46	25. Uses complex sentence	A definite instance of dependent clause required
50	26. Uses future tense correctly	Uses regular future form correctly in more than one instance
34	27. Uses correct regular comparative in adjectives	Any clear instance in spontaneous use accepted. These two items can be most conveniently treated together by the use of three objects alike except in size. Child
36	28. Uses correct regular	should be asked to compare for

Former Number		Item	Description
		superlative in adjectives	size the three and then any two. Care should be taken not to suggest the forms. Say "Here is a little one; this one is ....., and this one is ....."
25	29.	Uses irregular plural nouns correctly	This item was standardized on "man-men," "child-children." It is most conveniently checked by actual test.
47	30.	Uses a compound-complex sentence	This is a difficult item to sample. One may have best success by watching for it through the whole of the observation period.
41	31.	Uses correct regular superlative in adverbs	A picture of three children, horses, or cars racing is helpful here. Say, "See, this boy is running fast, but this one is running ....., and this one is running ....."
51	32.	Uses past perfect tense correctly	As in item 30, one may watch for this throughout the whole observation period.
52	33.	Uses future perfect tense correctly	As in item 32

Tentative Norms

The changes in the final form necessitated a rescoring of the test for normative purposes. Since the test is essentially a point scale, it seemed wise also to present the age standards in more conventional fashion. Thurstone's scaling procedure was therefore used. The scores given in the following tabulation are the age at par for each score point determinable from the data. The scores are based on tests from 177 Iowa City children.

Score Points	Age at Par, Months	Score Points	Age at Par, Months
4	7	25	33
5	(8)*	26	33
6	(8)	27	33
7	(10)	28	(34)
8	(11)	29	(35)
9	(13)	30	(36)
10	14	31	(37)
11	15	32	(38)
12	18	33	(39)

* Values in parentheses are interpolated, not calculated.

13	21	34	40
14	(23)	35	41
15	(25)	36	41
16	27	37	43
17	27	38	43
18	27	39	(46)
19	27	40	(50)
20	28	41	53
21	30	42	55
22	30	43	63
23	31	44	69
24	35		

Strictly speaking, of course, these values are not defensible as final norms, both by reason of the small number of cases and because of unquestionable selection in the sampling. They are given, therefore, merely as representative of a relatively superior group as described in the text.

The reliability of the revised form is practically identical with the orginal reliability as given above.

Williams
Form 1, 1937

LANGUAGE ACHIEVEMENT SCALE
Iowa Child Welfare Research Station
State University of Iowa, Iowa City, Iowa

Name..... Date..... Speech sounds.....

Recorder..... Age..... Intelligibility.....

Group..... Mental Age..... Organization.....

Age at par..... Quotient..... Total Score.....

Speech Sounds

1	2	3	4	5	6	7
t–	ʌ	ju	ʍ–	ʒ	kr-	skw–
p–	–b	tw–	–z	–d	sk–	θ-
i	–n	aɪ	tr–	sm–	pr–	ð–
f–	–d	ɔ:	gr–	–s	gl–	sl–
n–	aʊ	dʒ-	fr–	r–	–l	–ld
m–	g–	kw–	l–	kl–	br-	spl–
b–	–mp	–ks	dr–	st–	pl-	–st
u	k–	–nt	tʃ–	–tʃ	z–	–lk
h–	–p	–ns	s–	str-	–lf	–θ
d–	–f	ɪ	sp–	sn–	bl-	–nd
ʊ	–g		–v	sw–	v-	0r–
ɔɪ	–k		ʃ–		fl–	
–m	–t				–ʃ	
	ɛ:					

Intelligibility

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Organization

1. Vocalizes spontaneously
2. Attends to vocal stimulation
3. Vocalizes well-defined syllables
4. Responds vocally to vocal stimulation
5. Shows comprehension of vocal symbol
6. Uses vocal symbol to express meaning
7. Uses final consonant in syllables
8. Imitates sound in pitch or inflection
9. Uses five symbols to express meaning
10. Uses ten symbols to express meaning
11. Combines two words or symbols
12. Uses six conventional words
13. Uses agent-action or action-object structure
14. Definitely uses noun-verb or verb-object structure (2 examples)
15. Uses pronouns other than first person (2 examples)
16. Uses prepositions (2 examples)
17. Qualifies noun with adjective
18. Qualifies verb with adverb
19. Uses auxiliary in verb
20. Uses correct regular plural in nouns (2 examples)
21. Uses any other tense of verb than present
22. Uses conjunction
23. Uses past tense correctly (2 examples)
24. Uses compound sentence
25. Uses complex sentence
26. Uses future tense correctly (2 examples)
27. Uses correct regular comparative-adjectives
28. Uses correct regular superlative-adjectives
29. Uses correct irregular plural in nouns
30. Uses compound-complex sentence
31. Uses correct regular superlative-adverb
32. Uses past perfect tense correctly
33. Uses future perfect tense correctly

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